opticalmaterials Documentation

Release 0.1

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Contents:
This documentation supports *opticalmaterialspy*, a library useful for storing and calculating common optical material parameters.
An example script.

### 2.1 Example 1

```python
import opticalmaterialsipy as mat

m = mat.SiO2()

# Refractive index @ 1550nm.
print('n(1.55e-6m):', m.n(1.55e-6))  # Knows 1.55e-6 must be [m].
print('n(1.55um):', m.n(1.55))      # Knows 1.55 must be [um].
print('n(1550nm):', m.n(1550))      # Knows 1550 must be [nm].

# Group velocity refractive index @ 900nm.
print('n_gv(900nm):', m.ng(900))

# Group velocity dispersion @ 808nm.
print('GVD(0.808um):', m.gvd(0.808))
```
3.1 Materials

3.1.1 Classes

Air

Al2O3(axis)

Bbo(axis)

BiB0(axis)

Chalcogenide(chalcogenideType)

Data(wls, ns) An object that facilitates importing materials from lists.

Ktp(axis)

Ln(axis[, temperatureCelcius])

LnMg(axis)

LnMgTemp(axis[, temperatureCelcius])

RefractiveIndexWeb(web_link) Object to create a _Material based on data from https://refractiveindex.info/.

SiO2()

Su8()

Tfln(axis[, temperatureCelcius])

TiO2(axis)

Air

class Air

    Bases: opticalmaterials.py._material_base._Material

Methods Summary
**Methods Documentation**

**beta0** *(wavelength)*

The propagation constant with respect to wavelength.

**Parameters**

**wavelength** *(float, list, None)* – The wavelength(s) the propagation constant will be evaluated at.

**Returns**

The propagation constant at the target wavelength(s).

**Return type**

float, list

**beta1** *(wavelength)*

The derivative of the propagation constant with respect to wavelength.

**Parameters**

**wavelength** *(float, list, None)* – The wavelength(s) the propagation constant will be evaluated at.

**Returns**

The propagation constant at the target wavelength(s).

**Return type**

float, list

**beta2** *(wavelength)*

The second derivative of the propagation constant with respect to wavelength.

**Parameters**

**wavelength** *(float, list, None)* – The wavelength(s) the propagation constant will be evaluated at.

**Returns**

The propagation constant at the target wavelength(s).

**Return type**

float, list

**convertWavelengthUnitsNm** *

**eps** *(wavelength=None)*

The permittivity of the desired material.

**Parameters**

**wavelength** *(float, list, None)* – The wavelength the permittivity will be evaluated at.

**Returns**

The permittivity of the desired material.

**Return type**

float, list

**gvd** *(wavelength)*

The group velocity dispersion (GVD) with respect to wavelength.

**Parameters**

**wavelength** *(float, list, None)* – The wavelength(s) the group velocity will be evaluated at.

**Returns**

The group velocity dispersion at the target wavelength(s).

**Return type**

float, list

**n** *(wavelength)*

The refractive index of the desired material.

**Parameters**

**wavelength** *(float, list, None)* – The wavelength(s) the refractive index will be evaluated at.

**Returns**

The refractive index at the target wavelength(s).

**Return type**

float, list

**nDer1** *(wavelength)*

The first derivative of the refractive index with respect to wavelength.

**Parameters**

**wavelength** *(float, list, None)* – The wavelength(s) the first derivative of the refractive index will be evaluated at.

**Returns**

The first derivative of the refractive index at the target wavelength(s).

**Return type**

float, list

**nDer2** *(wavelength)*

The second derivative of the refractive index with respect to wavelength.

**Parameters**

**wavelength** *(float, list, None)* – The wavelength(s) the second derivative of the refractive index will be evaluated at.

**Returns**

The second derivative of the refractive index at the target wavelength(s).

**Return type**

float, list

**ng** *(wavelength)*

The group index with respect to wavelength.

**Parameters**

**wavelength** *(float, list, None)* – The wavelength(s) the group index will be evaluated at.

**Returns**

The group index at the target wavelength(s).

**Return type**

float, list

**vg** *(wavelength)*

The group velocities with respect to wavelength.

**Parameters**

**wavelength** *(float, list, None)* – The wavelength(s) the group velocities will be evaluated at.

**Returns**

The group velocities at the target wavelength(s).

**Return type**

float, list

**z0** *(wavelength)*

The wave impedance assuming the material is dielectric (not lossy or magnetic).
Returns The permittivity at the target wavelength.
Return type float, list

gvd(wavelength)
The group velocity dispersion (GVD) with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the GVD will be evaluated at.
Returns The GVD at the target wavelength(s).
Return type float, list

n(wavelength=None)
The refractive index of the desired material.

Parameters wavelength (float, list, None) – The wavelength the refractive index will be evaluated at.
Returns The refractive index at the target wavelength.
Return type float, list

nDer1(wavelength)
The first derivative of the refractive index with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the derivative will be evaluated at.
Returns The refractive index at the target wavelength(s).
Return type float, list

nDer2(wavelength)
The second derivative of the refractive index with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the derivative will be evaluated at.
Returns The refractive index at the target wavelength(s).
Return type float, list

ng(wavelength)
The group index with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the group index will be evaluated at.
Returns The group index at the target wavelength(s).
Return type float, list

vg(wavelength)
The group velocities with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the group velocities will be evaluated at.
Returns The group velocities at the target wavelength(s).
Return type float, list

z0(wavelength)
The wave impedance assuming the material is dielectric (not lossy or magnetic).
**Parameters** `wavelength (float, list, None)` – The wavelength(s) the propagation constant will be evaluated at.

**Returns** The impedance of the material.

**Return type** float, list

### Al2O3

**class Al2O3 (axis)**

*Bases:* `opticalmaterialspy._material_base._Material`

**Methods Summary**

<table>
<thead>
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<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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<td><code>beta0(wavelength)</code></td>
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<tr>
<td><code>beta1(wavelength)</code></td>
<td>The derivative of the propagation constant with respect to wavelength.</td>
</tr>
<tr>
<td><code>beta2(wavelength)</code></td>
<td>The second derivative of the propagation constant with respect to wavelength.</td>
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<tr>
<td><code>convertWavelengthUnitsNm()</code></td>
<td></td>
</tr>
<tr>
<td><code>eps([wavelength])</code></td>
<td>The permittivity of the desired material.</td>
</tr>
<tr>
<td><code>gvd([wavelength])</code></td>
<td>The group velocity dispersion (GVD) with respect to wavelength.</td>
</tr>
<tr>
<td><code>n([wavelength])</code></td>
<td>The refractive index of the desired material.</td>
</tr>
<tr>
<td><code>nDer1([wavelength])</code></td>
<td>The first derivative of the refractive index with respect to wavelength.</td>
</tr>
<tr>
<td><code>nDer2([wavelength])</code></td>
<td>The second derivative of the refractive index with respect to wavelength.</td>
</tr>
<tr>
<td><code>ng([wavelength])</code></td>
<td>The group index with respect to wavelength.</td>
</tr>
<tr>
<td><code>vg([wavelength])</code></td>
<td>The group velocities with respect to wavelength.</td>
</tr>
<tr>
<td><code>z0([wavelength])</code></td>
<td>The wave impedance assuming the material is dielectric (not lossy or magnetic).</td>
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</table>

**Methods Documentation**

**beta0 (wavelength)**

The propagation constant with respect to wavelength.

**Parameters** `wavelength (float, list, None)` – The wavelength(s) the propagation constant will be evaluated at.

**Returns** The propagation constant at the target wavelength(s).

**Return type** float, list

**beta1 (wavelength)**

The derivative of the propagation constant with respect to wavelength.

**Parameters** `wavelength (float, list, None)` – The wavelength(s) the propagation constant will be evaluated at.

**Returns** The propagation constant at the target wavelength(s).

**Return type** float, list
**beta2** (*wavelength*)

The second derivative of the propagation constant with respect to wavelength.

- **Parameters**
  - `wavelength` (*float, list, None*) – The wavelength(s) the propagation constant will be evaluated at.

- **Returns**
  - The propagation constant at the target wavelength(s).

- **Return type**
  - float, list

**convertWavelengthUnitsNm()**

**eps** (*wavelength=None*)

The permittivity of the desired material.

- **Parameters**
  - `wavelength` (*float, list, None*) – The wavelength the permittivity will be evaluated at.

- **Returns**
  - The permittivity at the target wavelength.

- **Return type**
  - float, list

**gvd** (*wavelength*)

The group velocity dispersion (GVD) with respect to wavelength.

- **Parameters**
  - `wavelength` (*float, list, None*) – The wavelength(s) the GVD will be evaluated at.

- **Returns**
  - The GVD at the target wavelength(s).

- **Return type**
  - float, list

**n** (*wavelength=None*)

The refractive index of the desired material.

- **Parameters**
  - `wavelength` (*float, list, None*) – The wavelength the refractive index will be evaluated at.

- **Returns**
  - The refractive index at the target wavelength.

- **Return type**
  - float, list

**nDer1** (*wavelength*)

The first derivative of the refractive index with respect to wavelength.

- **Parameters**
  - `wavelength` (*float, list, None*) – The wavelength(s) the derivative will be evaluated at.

- **Returns**
  - The refractive index at the target wavelength(s).

- **Return type**
  - float, list

**nDer2** (*wavelength*)

The second derivative of the refractive index with respect to wavelength.

- **Parameters**
  - `wavelength` (*float, list, None*) – The wavelength(s) the derivative will be evaluated at.

- **Returns**
  - The refractive index at the target wavelength(s).

- **Return type**
  - float, list

**ng** (*wavelength*)

The group index with respect to wavelength.

- **Parameters**
  - `wavelength` (*float, list, None*) – The wavelength(s) the group index will be evaluated at.
Returns The group index at the target wavelength(s).

Return type float, list

vg (wavelength)
The group velocities with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the group velocities will be evaluated at.

Returns The group velocities at the target wavelength(s).

Return type float, list

z0 (wavelength)
The wave impedance assuming the material is dielectric (not lossy or magnetic).

Parameters wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns The impedance of the material.

Return type float, list

Bbo

class Bbo (axis)
Bases: opticalmaterialspy._material_base._Material

Methods Summary

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<td>The permittivity of the desired material.</td>
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<tr>
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<td>The group velocity dispersion (GVD) with respect to wavelength.</td>
</tr>
<tr>
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<td>The refractive index of the desired material.</td>
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Methods Documentation

beta0 (wavelength)
The propagation constant with respect to wavelength.
Parameters `wavelength (float, list, None)`: The wavelength(s) the propagation constant will be evaluated at.

**Returns** The propagation constant at the target wavelength(s).

**Return type** float, list

### beta1 (wavelength)

The derivative of the propagation constant with respect to wavelength.

Parameters `wavelength (float, list, None)`: The wavelength(s) the propagation constant will be evaluated at.

**Returns** The propagation constant at the target wavelength(s).

**Return type** float, list

### beta2 (wavelength)

The second derivative of the propagation constant with respect to wavelength.

Parameters `wavelength (float, list, None)`: The wavelength(s) the propagation constant will be evaluated at.

**Returns** The propagation constant at the target wavelength(s).

**Return type** float, list

### convertWavelengthUnitsNm ()

**eps (wavelength=None)

The permittivity of the desired material.

Parameters `wavelength (float, list, None)`: The wavelength the permittivity will be evaluated at.

**Returns** The permittivity at the target wavelength.

**Return type** float, list

### gvd (wavelength)

The group velocity dispersion (GVD) with respect to wavelength.

Parameters `wavelength (float, list, None)`: The wavelength(s) the GVD will be evaluated at.

**Returns** The GVD at the target wavelength(s).

**Return type** float, list

### n (wavelength=None)

The refractive index of the desired material.

Parameters `wavelength (float, list, None)`: The wavelength the refractive index will be evaluated at.

**Returns** The refractive index at the target wavelength.

**Return type** float, list

### nDer1 (wavelength)

The first derivative of the refractive index with respect to wavelength.

Parameters `wavelength (float, list, None)`: The wavelength(s) the derivative will be evaluated at.

**Returns** The refractive index at the target wavelength(s).
Return type: float, list

nDer2 (wavelength)
The second derivative of the refractive index with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the derivative will be evaluated at.

Returns The refractive index at the target wavelength(s).

Return type: float, list

ng (wavelength)
The group index with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the group index will be evaluated at.

Returns The group index at the target wavelength(s).

Return type: float, list

vg (wavelength)
The group velocities with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the group velocities will be evaluated at.

Returns The group velocities at the target wavelength(s).

Return type: float, list

z0 (wavelength)
The wave impedance assuming the material is dielectric (not lossy or magnetic).

Parameters wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns The impedance of the material.

Return type: float, list

Bibo
class Bibo (axis)
    Bases: opticalmaterials.Bbo

Methods Summary

  beta0(wavelength) The propagation constant with respect to wavelength.
  beta1(wavelength) The derivative of the propagation constant with respect to wavelength.
  beta2(wavelength) The second derivative of the propagation constant with respect to wavelength.
  convertWavelengthUnitsNm() 
  eps([wavelength]) The permittivity of the desired material.
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<table>
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<td>The first derivative of the refractive index with respect to wavelength.</td>
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Methods Documentation

**beta0** *(wavelength)*
The propagation constant with respect to wavelength.

Parameters **wavelength** *(float, list, None)* – The wavelength(s) the propagation constant will be evaluated at.

Returns The propagation constant at the target wavelength(s).

Return type float, list

**beta1** *(wavelength)*
The derivative of the propagation constant with respect to wavelength.

Parameters **wavelength** *(float, list, None)* – The wavelength(s) the propagation constant will be evaluated at.

Returns The propagation constant at the target wavelength(s).

Return type float, list

**beta2** *(wavelength)*
The second derivative of the propagation constant with respect to wavelength.

Parameters **wavelength** *(float, list, None)* – The wavelength(s) the propagation constant will be evaluated at.

Returns The propagation constant at the target wavelength(s).

Return type float, list

**convertWavelengthUnitsNm** ()

**eps** *(wavelength=None)*
The permittivity of the desired material.

Parameters **wavelength** *(float, list, None)* – The wavelength the permittivity will be evaluated at.

Returns The permittivity at the target wavelength.

Return type float, list

**gvd** *(wavelength)*
The group velocity dispersion (GVD) with respect to wavelength.

Parameters **wavelength** *(float, list, None)* – The wavelength(s) the GVD will be evaluated at.
Returns The GVD at the target wavelength(s).

Return type float, list

\textbf{n} (\texttt{wavelength=None})
The refractive index of the desired material.

**Parameters** \texttt{wavelength} (float, list, None) – The wavelength the refractive index will be evaluated at.

**Returns** The refractive index at the target wavelength.

**Return type** float, list

\textbf{nDer1} (\texttt{wavelength})
The first derivative of the refractive index with respect to wavelength.

**Parameters** \texttt{wavelength} (float, list, None) – The wavelength(s) the derivative will be evaluated at.

**Returns** The refractive index at the target wavelength(s).

**Return type** float, list

\textbf{nDer2} (\texttt{wavelength})
The second derivative of the refractive index with respect to wavelength.

**Parameters** \texttt{wavelength} (float, list, None) – The wavelength(s) the derivative will be evaluated at.

**Returns** The refractive index at the target wavelength(s).

**Return type** float, list

\textbf{ng} (\texttt{wavelength})
The group index with respect to wavelength.

**Parameters** \texttt{wavelength} (float, list, None) – The wavelength(s) the group index will be evaluated at.

**Returns** The group index at the target wavelength(s).

**Return type** float, list

\textbf{vg} (\texttt{wavelength})
The group velocities with respect to wavelength.

**Parameters** \texttt{wavelength} (float, list, None) – The wavelength(s) the group velocities will be evaluated at.

**Returns** The group velocities at the target wavelength(s).

**Return type** float, list

\textbf{z0} (\texttt{wavelength})
The wave impedance assuming the material is dielectric (not lossy or magnetic).

**Parameters** \texttt{wavelength} (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

**Returns** The impedance of the material.

**Return type** float, list
Chalcogenide

class Chalcogenide(chalcogenideType)
    Bases: opticalmaterialspy._material_base._Material

Methods Summary

beta0(wavelength) The propagation constant with respect to wavelength.
betal1(wavelength) The derivative of the propagation constant with respect to wavelength.
beta2(wavelength) The second derivative of the propagation constant with respect to wavelength.
convertWavelengthUnitsNm()  
eps([wavelength]) The permittivity of the desired material.
gvd(wavelength) The group velocity dispersion (GVD) with respect to wavelength.
n([wavelength]) The refractive index of the desired material.
nDer1(wavelength) The first derivative of the refractive index with respect to wavelength.
nDer2(wavelength) The second derivative of the refractive index with respect to wavelength.
ng(wavelength) The group index with respect to wavelength.
vg(wavelength) The group velocities with respect to wavelength.
z0(wavelength) The wave impedance assuming the material is dielectric (not lossy or magnetic).

Methods Documentation

beta0 (wavelength)
The propagation constant with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns The propagation constant at the target wavelength(s).

Return type float, list

betal1 (wavelength)
The derivative of the propagation constant with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns The propagation constant at the target wavelength(s).

Return type float, list

beta2 (wavelength)
The second derivative of the propagation constant with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns The propagation constant at the target wavelength(s).
Return type  float, list

convertWavelengthUnitsNm()

eps(wavelength=None)
The permittivity of the desired material.

Parameters  wavelength (float, list, None) – The wavelength the permittivity will be evaluated at.

Returns  The permittivity at the target wavelength.

Return type  float, list

gvd(wavelength)
The group velocity dispersion (GVD) with respect to wavelength.

Parameters  wavelength (float, list, None) – The wavelength(s) the GVD will be evaluated at.

Returns  The GVD at the target wavelength(s).

Return type  float, list

n(wavelength=None)
The refractive index of the desired material.

Parameters  wavelength (float, list, None) – The wavelength the refractive index will be evaluated at.

Returns  The refractive index at the target wavelength.

Return type  float, list

nDer1(wavelength)
The first derivative of the refractive index with respect to wavelength.

Parameters  wavelength (float, list, None) – The wavelength(s) the derivative will be evaluated at.

Returns  The refractive index at the target wavelength(s).

Return type  float, list

nDer2(wavelength)
The second derivative of the refractive index with respect to wavelength.

Parameters  wavelength (float, list, None) – The wavelength(s) the derivative will be evaluated at.

Returns  The refractive index at the target wavelength(s).

Return type  float, list

ng(wavelength)
The group index with respect to wavelength.

Parameters  wavelength (float, list, None) – The wavelength(s) the group index will be evaluated at.

Returns  The group index at the target wavelength(s).

Return type  float, list

vg(wavelength)
The group velocities with respect to wavelength.
Parameters `wavelength (float, list, None)` – The wavelength(s) the group velocities will be evaluated at.

Returns The group velocities at the target wavelength(s).

Return type float, list

\( z_0 (\text{wavelength}) \)

The wave impedance assuming the material is dielectric (not lossy or magnetic).

Parameters `wavelength (float, list, None)` – The wavelength(s) the propagation constant will be evaluated at.

Returns The impedance of the material.

Return type float, list

### Data

```python
class Data(wls, ns)
    Bases: opticalmaterialspy._material_base._Material
```

An object that facilitates importing materials from lists.

Parameters

- `wls (list)` – List of wavelengths.
- `ns (list)` – List of refractive indices at the corresponding `wls`. Should be the same size as `wls`.

### Methods Summary

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<td>( vg (\text{wavelength}) )</td>
<td>The group velocities with respect to wavelength.</td>
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\textbf{beta0}(\textit{wavelength})

The propagation constant with respect to wavelength.

\textbf{Parameters} \textit{wavelength}(float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

\textbf{Returns} The propagation constant at the target wavelength(s).

\textbf{Return type} float, list

\textbf{beta1}(\textit{wavelength})

The derivative of the propagation constant with respect to wavelength.

\textbf{Parameters} \textit{wavelength}(float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

\textbf{Returns} The propagation constant at the target wavelength(s).

\textbf{Return type} float, list

\textbf{beta2}(\textit{wavelength})

The second derivative of the propagation constant with respect to wavelength.

\textbf{Parameters} \textit{wavelength}(float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

\textbf{Returns} The propagation constant at the target wavelength(s).

\textbf{Return type} float, list

\textbf{convertWavelengthUnitsNm}(\textit{})

\textbf{eps}(\textit{wavelength=\textit{None}})

The permittivity of the desired material.

\textbf{Parameters} \textit{wavelength}(float, list, None) – The wavelength the permittivity will be evaluated at.

\textbf{Returns} The permittivity at the target wavelength.

\textbf{Return type} float, list

\textbf{gvd}(\textit{wavelength})

The group velocity dispersion (GVD) with respect to wavelength.

\textbf{Parameters} \textit{wavelength}(float, list, None) – The wavelength(s) the GVD will be evaluated at.

\textbf{Returns} The GVD at the target wavelength(s).

\textbf{Return type} float, list

\textbf{n}(\textit{wavelength=\textit{None}})

The refractive index of the desired material.

\textbf{Parameters} \textit{wavelength}(float, list, None) – The wavelength the refractive index will be evaluated at.

\textbf{Returns} The refractive index at the target wavelength.

\textbf{Return type} float, list

\textbf{nDer1}(\textit{wavelength})

The first derivative of the refractive index with respect to wavelength.
Parameters `wavelength` *(float, list, None)* – The wavelength(s) the derivative will be evaluated at.

Returns The refractive index at the target wavelength(s).

Return type float, list

`nDer2` *(wavelength)*
The second derivative of the refractive index with respect to wavelength.

Parameters `wavelength` *(float, list, None)* – The wavelength(s) the derivative will be evaluated at.

Returns The refractive index at the target wavelength(s).

Return type float, list

`ng` *(wavelength)*
The group index with respect to wavelength.

Parameters `wavelength` *(float, list, None)* – The wavelength(s) the group index will be evaluated at.

Returns The group index at the target wavelength(s).

Return type float, list

`vg` *(wavelength)*
The group velocities with respect to wavelength.

Parameters `wavelength` *(float, list, None)* – The wavelength(s) the group velocities will be evaluated at.

Returns The group velocities at the target wavelength(s).

Return type float, list

`z0` *(wavelength)*
The wave impedance assuming the material is dielectric (not lossy or magnetic).

Parameters `wavelength` *(float, list, None)* – The wavelength(s) the propagation constant will be evaluated at.

Returns The impedance of the material.

Return type float, list

**Ktp**

class Ktp *(axis)*
Bases: opticalmaterialsipy._material_base._Material

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**Methods Documentation**

\( \beta_0 \) (\textit{wavelength})

The propagation constant with respect to wavelength.

**Parameters** \( \text{wavelength} \) (\textit{float, list, None}) – The wavelength(s) the propagation constant will be evaluated at.

**Returns** The propagation constant at the target wavelength(s).

**Return type** float, list

\( \beta_1 \) (\textit{wavelength})

The derivative of the propagation constant with respect to wavelength.

**Parameters** \( \text{wavelength} \) (\textit{float, list, None}) – The wavelength(s) the propagation constant will be evaluated at.

**Returns** The propagation constant at the target wavelength(s).

**Return type** float, list

\( \beta_2 \) (\textit{wavelength})

The second derivative of the propagation constant with respect to wavelength.

**Parameters** \( \text{wavelength} \) (\textit{float, list, None}) – The wavelength(s) the propagation constant will be evaluated at.

**Returns** The propagation constant at the target wavelength(s).

**Return type** float, list

\( \text{convertWavelengthUnitsNm}() \)

**eps** (\textit{wavelength=\text{None}})

The permittivity of the desired material.

**Parameters** \( \text{wavelength} \) (\textit{float, list, None}) – The wavelength the permittivity will be evaluated at.

**Returns** The permittivity at the target wavelength.

**Return type** float, list
**gvd** *(wavelength)*

The group velocity dispersion (GVD) with respect to wavelength.

**Parameters**

- **wavelength** *(float, list, None)* – The wavelength(s) the GVD will be evaluated at.

**Returns**

The GVD at the target wavelength(s).

**Return type**

float, list

**n** *(wavelength=None)*

The refractive index of the desired material.

**Parameters**

- **wavelength** *(float, list, None)* – The wavelength the refractive index will be evaluated at.

**Returns**

The refractive index at the target wavelength.

**Return type**

float, list

**nDer1** *(wavelength)*

The first derivative of the refractive index with respect to wavelength.

**Parameters**

- **wavelength** *(float, list, None)* – The wavelength(s) the derivative will be evaluated at.

**Returns**

The refractive index at the target wavelength(s).

**Return type**

float, list

**nDer2** *(wavelength)*

The second derivative of the refractive index with respect to wavelength.

**Parameters**

- **wavelength** *(float, list, None)* – The wavelength(s) the derivative will be evaluated at.

**Returns**

The refractive index at the target wavelength(s).

**Return type**

float, list

**ng** *(wavelength)*

The group index with respect to wavelength.

**Parameters**

- **wavelength** *(float, list, None)* – The wavelength(s) the group index will be evaluated at.

**Returns**

The group index at the target wavelength(s).

**Return type**

float, list

**vg** *(wavelength)*

The group velocities with respect to wavelength.

**Parameters**

- **wavelength** *(float, list, None)* – The wavelength(s) the group velocities will be evaluated at.

**Returns**

The group velocities at the target wavelength(s).

**Return type**

float, list

**z0** *(wavelength)*

The wave impedance assuming the material is dielectric (not lossy or magnetic).

**Parameters**

- **wavelength** *(float, list, None)* – The wavelength(s) the propagation constant will be evaluated at.

**Returns**

The impedance of the material.
Return type  float, list

Ln

class Ln (axis, temperatureCelcius=20.0)
    Bases: opticalmaterialspy._material_base._Material

Methods Summary

- **beta0**(wavelength)  The propagation constant with respect to wavelength.
- **beta1**(wavelength)  The derivative of the propagation constant with respect to wavelength.
- **beta2**(wavelength)  The second derivative of the propagation constant with respect to wavelength.
- **convertWavelengthUnitsNm**()  
- **eps**(wavelength)  The permittivity of the desired material.
- **gvd**(wavelength)  The group velocity dispersion (GVD) with respect to wavelength.
- **n**(wavelength)  The refractive index of the desired material.
- **nDer1**(wavelength)  The first derivative of the refractive index with respect to wavelength.
- **nDer2**(wavelength)  The second derivative of the refractive index with respect to wavelength.
- **ng**(wavelength)  The group index with respect to wavelength.
- **vg**(wavelength)  The group velocities with respect to wavelength.
- **z0**(wavelength)  The wave impedance assuming the material is dielectric (not lossy or magnetic).

Methods Documentation

**beta0**(wavelength)
    The propagation constant with respect to wavelength.

    **Parameters**
    wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

    **Returns**
    The propagation constant at the target wavelength(s).

    **Return type**  float, list

**beta1**(wavelength)
    The derivative of the propagation constant with respect to wavelength.

    **Parameters**
    wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

    **Returns**
    The propagation constant at the target wavelength(s).

    **Return type**  float, list

**beta2**(wavelength)
    The second derivative of the propagation constant with respect to wavelength.
Parameters \texttt{wavelength} ($\texttt{float, list, None}$) – The wavelength(s) the propagation constant will be evaluated at.

Returns The propagation constant at the target wavelength(s).

Return type float, list

c\texttt{onvertWavelengthUnitsNm}()

e\texttt{ps} \texttt{(wavelength=\texttt{None})}
The permittivity of the desired material.

Parameters \texttt{wavelength} ($\texttt{float, list, None}$) – The wavelength the permittivity will be evaluated at.

Returns The permittivity at the target wavelength.

Return type float, list

g\texttt{vd} \texttt{(wavelength)}
The group velocity dispersion (GVD) with respect to wavelength.

Parameters \texttt{wavelength} ($\texttt{float, list, None}$) – The wavelength(s) the GVD will be evaluated at.

Returns The GVD at the target wavelength(s).

Return type float, list

n \texttt{(wavelength=\texttt{None})}
The refractive index of the desired material.

Parameters \texttt{wavelength} ($\texttt{float, list, None}$) – The wavelength the refractive index will be evaluated at.

Returns The refractive index at the target wavelength.

Return type float, list

n\texttt{Der1} \texttt{(wavelength)}
The first derivative of the refractive index with respect to wavelength.

Parameters \texttt{wavelength} ($\texttt{float, list, None}$) – The wavelength(s) the derivative will be evaluated at.

Returns The refractive index at the target wavelength(s).

Return type float, list

n\texttt{Der2} \texttt{(wavelength)}
The second derivative of the refractive index with respect to wavelength.

Parameters \texttt{wavelength} ($\texttt{float, list, None}$) – The wavelength(s) the derivative will be evaluated at.

Returns The refractive index at the target wavelength(s).

Return type float, list

ng \texttt{(wavelength)}
The group index with respect to wavelength.

Parameters \texttt{wavelength} ($\texttt{float, list, None}$) – The wavelength(s) the group index will be evaluated at.

Returns The group index at the target wavelength(s).
Return type  float, list

vg (wavelength)
The group velocities with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the group velocities will be evaluated at.

Returns  The group velocities at the target wavelength(s).

Return type  float, list

z0 (wavelength)
The wave impedance assuming the material is dielectric (not lossy or magnetic).

Parameters wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns  The impedance of the material.

LnMg

class LnMg (axis)
Bases: opticalmaterialspy._material_base._Material

Methods Summary

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<td>The group velocity dispersion (GVD) with respect to wavelength.</td>
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<tr>
<td>n(wavelength)</td>
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<td>nDer1(wavelength)</td>
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<td>ng(wavelength)</td>
<td>The group index with respect to wavelength.</td>
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<td>vg(wavelength)</td>
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<tr>
<td>z0(wavelength)</td>
<td>The wave impedance assuming the material is dielectric (not lossy or magnetic).</td>
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beta0 (wavelength)
The propagation constant with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the propagation
constant will be evaluated at.

Returns The propagation constant at the target wavelength(s).

Return type float, list

$\beta_1 (wavelength)$
The derivative of the propagation constant with respect to wavelength.

Parameters $wavelength$ (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns The propagation constant at the target wavelength(s).

Return type float, list

$\beta_2 (wavelength)$
The second derivative of the propagation constant with respect to wavelength.

Parameters $wavelength$ (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns The propagation constant at the target wavelength(s).

Return type float, list

$convertWavelengthUnitsNm ()$

$\varepsilon (wavelength=None)$
The permittivity of the desired material.

Parameters $wavelength$ (float, list, None) – The wavelength the permittivity will be evaluated at.

Returns The permittivity at the target wavelength.

Return type float, list

$gvd (wavelength)$
The group velocity dispersion (GVD) with respect to wavelength.

Parameters $wavelength$ (float, list, None) – The wavelength(s) the GVD will be evaluated at.

Returns The GVD at the target wavelength(s).

Return type float, list

$n (wavelength=None)$
The refractive index of the desired material.

Parameters $wavelength$ (float, list, None) – The wavelength the refractive index will be evaluated at.

Returns The refractive index at the target wavelength.

Return type float, list

$nDer1 (wavelength)$
The first derivative of the refractive index with respect to wavelength.

Parameters $wavelength$ (float, list, None) – The wavelength(s) the derivative will be evaluated at.

Returns The refractive index at the target wavelength(s).

Return type float, list
**nDer2** *(wavelength)*

The second derivative of the refractive index with respect to wavelength.

**Parameters**

- **wavelength** *(float, list, None)* – The wavelength(s) the derivative will be evaluated at.

**Returns**

The refractive index at the target wavelength(s).

**Return type**

float, list

**ng** *(wavelength)*

The group index with respect to wavelength.

**Parameters**

- **wavelength** *(float, list, None)* – The wavelength(s) the group index will be evaluated at.

**Returns**

The group index at the target wavelength(s).

**Return type**

float, list

**vg** *(wavelength)*

The group velocities with respect to wavelength.

**Parameters**

- **wavelength** *(float, list, None)* – The wavelength(s) the group velocities will be evaluated at.

**Returns**

The group velocities at the target wavelength(s).

**Return type**

float, list

**z0** *(wavelength)*

The wave impedance assuming the material is dielectric (not lossy or magnetic).

**Parameters**

- **wavelength** *(float, list, None)* – The wavelength(s) the propagation constant will be evaluated at.

**Returns**

The impedance of the material.

**Return type**

float, list

---

**LnMgTemp**

**class LnMgTemp**(axis, temperatureCelcius=20.0)

**Bases:** opticalmaterialspy._material_base._Material

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<td>beta1 <em>(wavelength)</em></td>
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<tr>
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<td>eps <em>(wavelength)</em></td>
<td>The permittivity of the desired material.</td>
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<td>gvd <em>(wavelength)</em></td>
<td>The group velocity dispersion (GVD) with respect to wavelength.</td>
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<tr>
<td>n <em>(wavelength)</em></td>
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**Methods Documentation**

**beta0 (wavelength)**

The propagation constant with respect to wavelength.

- **Parameters** `wavelength (float, list, None)` – The wavelength(s) the propagation constant will be evaluated at.

- **Returns** The propagation constant at the target wavelength(s).

- **Return type** float, list

**beta1 (wavelength)**

The derivative of the propagation constant with respect to wavelength.

- **Parameters** `wavelength (float, list, None)` – The wavelength(s) the propagation constant will be evaluated at.

- **Returns** The propagation constant at the target wavelength(s).

- **Return type** float, list

**beta2 (wavelength)**

The second derivative of the propagation constant with respect to wavelength.

- **Parameters** `wavelength (float, list, None)` – The wavelength(s) the propagation constant will be evaluated at.

- **Returns** The propagation constant at the target wavelength(s).

- **Return type** float, list

**convertWavelengthUnitsNm ()**

**eps (wavelength=None)**

The permittivity of the desired material.

- **Parameters** `wavelength (float, list, None)` – The wavelength the permittivity will be evaluated at.

- **Returns** The permittivity at the target wavelength.

- **Return type** float, list

**gvd (wavelength)**

The group velocity dispersion (GVD) with respect to wavelength.

- **Parameters** `wavelength (float, list, None)` – The wavelength(s) the GVD will be evaluated at.

- **Returns** The GVD at the target wavelength(s).

- **Return type** float, list

3.1. Materials
n (wavelength=None)
The refractive index of the desired material.

Parameters wavelength (float, list, None) – The wavelength the refractive index will be evaluated at.

Returns The refractive index at the target wavelength.

Return type float, list

nDer1 (wavelength)
The first derivative of the refractive index with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the derivative will be evaluated at.

Returns The refractive index at the target wavelength(s).

Return type float, list

nDer2 (wavelength)
The second derivative of the refractive index with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the derivative will be evaluated at.

Returns The refractive index at the target wavelength(s).

Return type float, list

ng (wavelength)
The group index with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the group index will be evaluated at.

Returns The group index at the target wavelength(s).

Return type float, list

vg (wavelength)
The group velocities with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the group velocities will be evaluated at.

Returns The group velocities at the target wavelength(s).

Return type float, list

z0 (wavelength)
The wave impedance assuming the material is dielectric (not lossy or magnetic).

Parameters wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns The impedance of the material.

Return type float, list

RefractiveIndexWeb

class RefractiveIndexWeb (web_link)
Bases: opticalmaterialspy.material.Data
Object to create a `_Material` based on data from https://refractiveindex.info/.

**Parameters** `web_link (str)` – The web link to the material. As an example, for GaAs by Aspnes et al. 1986 the one should use ‘https://refractiveindex.info/?shelf=main&book=GaAs&page=Aspnes’.

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<td>The derivative of the propagation constant with respect to wavelength.</td>
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<td><code>convertWavelengthUnitsNm()</code></td>
<td>The permittivity of the desired material.</td>
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<tr>
<td><code>eps([wavelength])</code></td>
<td>The group velocity dispersion (GVD) with respect to wavelength.</td>
</tr>
<tr>
<td><code>gvd(wavelength)</code></td>
<td>The refractive index of the desired material.</td>
</tr>
<tr>
<td><code>n([wavelength])</code></td>
<td>The first derivative of the refractive index with respect to wavelength.</td>
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<td><code>nDer1(wavelength)</code></td>
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<td>The group index with respect to wavelength.</td>
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<td><code>ng(wavelength)</code></td>
<td>The group velocities with respect to wavelength.</td>
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**Methods Documentation**

**`beta0 (wavelength)`**

The propagation constant with respect to wavelength.

**Parameters** `wavelength (float, list, None)` – The wavelength(s) the propagation constant will be evaluated at.

**Returns** The propagation constant at the target wavelength(s).

**Return type** float, list

**`beta1 (wavelength)`**

The derivative of the propagation constant with respect to wavelength.

**Parameters** `wavelength (float, list, None)` – The wavelength(s) the propagation constant will be evaluated at.

**Returns** The propagation constant at the target wavelength(s).

**Return type** float, list

**`beta2 (wavelength)`**

The second derivative of the propagation constant with respect to wavelength.

**Parameters** `wavelength (float, list, None)` – The wavelength(s) the propagation constant will be evaluated at.

**Returns** The propagation constant at the target wavelength(s).
Return type float, list

\texttt{convertWavelengthUnitsNm()}

\texttt{eps(wavelength=\texttt{None})}
The permittivity of the desired material.

\textbf{Parameters} \texttt{wavelength (float, list, None)} – The wavelength the permittivity will be evaluated at.

\textbf{Returns} The permittivity at the target wavelength.

\textbf{Return type} float, list

\texttt{gvd(wavelength)}
The group velocity dispersion (GVD) with respect to wavelength.

\textbf{Parameters} \texttt{wavelength (float, list, None)} – The wavelength(s) the GVD will be evaluated at.

\textbf{Returns} The GVD at the target wavelength(s).

\textbf{Return type} float, list

\texttt{n(wavelength=\texttt{None})}
The refractive index of the desired material.

\textbf{Parameters} \texttt{wavelength (float, list, None)} – The wavelength the refractive index will be evaluated at.

\textbf{Returns} The refractive index at the target wavelength.

\textbf{Return type} float, list

\texttt{nDer1 (wavelength)}
The first derivative of the refractive index with respect to wavelength.

\textbf{Parameters} \texttt{wavelength (float, list, None)} – The wavelength(s) the derivative will be evaluated at.

\textbf{Returns} The refractive index at the target wavelength(s).

\textbf{Return type} float, list

\texttt{nDer2 (wavelength)}
The second derivative of the refractive index with respect to wavelength.

\textbf{Parameters} \texttt{wavelength (float, list, None)} – The wavelength(s) the derivative will be evaluated at.

\textbf{Returns} The refractive index at the target wavelength(s).

\textbf{Return type} float, list

\texttt{ng(wavelength)}
The group index with respect to wavelength.

\textbf{Parameters} \texttt{wavelength (float, list, None)} – The wavelength(s) the group index will be evaluated at.

\textbf{Returns} The group index at the target wavelength(s).

\textbf{Return type} float, list

\texttt{vg(wavelength)}
The group velocities with respect to wavelength.
**Parameters** `wavelength` *(float, list, None)* – The wavelength(s) the group velocities will be evaluated at.

**Returns** The group velocities at the target wavelength(s).

**Return type** float, list

\( z_0 \) *(wavelength)*

The wave impedance assuming the material is dielectric (not lossy or magnetic).

**Parameters** `wavelength` *(float, list, None)* – The wavelength(s) the propagation constant will be evaluated at.

**Returns** The impedance of the material.

**Return type** float, list

---

**SiO2**

class SiO2

Bases: `opticalmaterialspy._material_base._Material`

**Methods Summary**

- `beta0(wavelength)`
  - The propagation constant with respect to wavelength.
- `beta1(wavelength)`
  - The derivative of the propagation constant with respect to wavelength.
- `beta2(wavelength)`
  - The second derivative of the propagation constant with respect to wavelength.
- `convertWavelengthUnitsNm()`
- `eps([wavelength])`
  - The permittivity of the desired material.
- `gvd(wavelength)`
  - The group velocity dispersion (GVD) with respect to wavelength.
- `n([wavelength])`
  - The refractive index of the desired material.
- `nDer1(wavelength)`
  - The first derivative of the refractive index with respect to wavelength.
- `nDer2(wavelength)`
  - The second derivative of the refractive index with respect to wavelength.
- `ng(wavelength)`
  - The group index with respect to wavelength.
- `vg(wavelength)`
  - The group velocities with respect to wavelength.
- `z0(wavelength)`
  - The wave impedance assuming the material is dielectric (not lossy or magnetic).

**Methods Documentation**

**beta0 (wavelength)**

The propagation constant with respect to wavelength.

**Parameters** `wavelength` *(float, list, None)* – The wavelength(s) the propagation constant will be evaluated at.

**Returns** The propagation constant at the target wavelength(s).

**Return type** float, list

---

3.1. Materials
**beta1** (*wavelength*)
The derivative of the propagation constant with respect to wavelength.

- **Parameters** 
  - `wavelength (float, list, None)` – The wavelength(s) the propagation constant will be evaluated at.

- **Returns** 
  - The propagation constant at the target wavelength(s).

- **Return type** 
  - float, list

**beta2** (*wavelength*)
The second derivative of the propagation constant with respect to wavelength.

- **Parameters** 
  - `wavelength (float, list, None)` – The wavelength(s) the propagation constant will be evaluated at.

- **Returns** 
  - The propagation constant at the target wavelength(s).

- **Return type** 
  - float, list

**convertWavelengthUnitsNm ()**

**eps** (*wavelength=None*)
The permittivity of the desired material.

- **Parameters** 
  - `wavelength (float, list, None)` – The wavelength the permittivity will be evaluated at.

- **Returns** 
  - The permittivity at the target wavelength.

- **Return type** 
  - float, list

**gvd** (*wavelength*)
The group velocity dispersion (GVD) with respect to wavelength.

- **Parameters** 
  - `wavelength (float, list, None)` – The wavelength(s) the GVD will be evaluated at.

- **Returns** 
  - The GVD at the target wavelength(s).

- **Return type** 
  - float, list

**n** (*wavelength=None*)
The refractive index of the desired material.

- **Parameters** 
  - `wavelength (float, list, None)` – The wavelength the refractive index will be evaluated at.

- **Returns** 
  - The refractive index at the target wavelength.

- **Return type** 
  - float, list

**nDer1** (*wavelength*)
The first derivative of the refractive index with respect to wavelength.

- **Parameters** 
  - `wavelength (float, list, None)` – The wavelength(s) the derivative will be evaluated at.

- **Returns** 
  - The refractive index at the target wavelength(s).

- **Return type** 
  - float, list

**nDer2** (*wavelength*)
The second derivative of the refractive index with respect to wavelength.

- **Parameters** 
  - `wavelength (float, list, None)` – The wavelength(s) the derivative will be evaluated at.
Returns The refractive index at the target wavelength(s).

**Return type** float, list

\texttt{ng}(wavelength)
The group index with respect to wavelength.

**Parameters**

\texttt{wavelength} (float, list, None) – The wavelength(s) the group index will be evaluated at.

**Returns** The group index at the target wavelength(s).

**Return type** float, list

\texttt{vg}(wavelength)
The group velocities with respect to wavelength.

**Parameters**

\texttt{wavelength} (float, list, None) – The wavelength(s) the group velocities will be evaluated at.

**Returns** The group velocities at the target wavelength(s).

**Return type** float, list

\texttt{z0}(wavelength)
The wave impedance assuming the material is dielectric (not lossy or magnetic).

**Parameters**

\texttt{wavelength} (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

**Returns** The impedance of the material.

**Return type** float, list

\texttt{Su8}

\texttt{class Su8}

\texttt{Bases: opticalmaterials.py._material_base._Material}

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<td>The second derivative of the refractive index with respect to wavelength.</td>
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<tr>
<td>\texttt{ng}(wavelength)</td>
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| $vg(wavelength)$ | The group velocities with respect to wavelength. |
| $z_0(wavelength)$ | The wave impedance assuming the material is dielectric (not lossy or magnetic). |

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beta0 (wavelength)
The propagation constant with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns The propagation constant at the target wavelength(s).

Return type float, list

beta1 (wavelength)
The derivative of the propagation constant with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns The propagation constant at the target wavelength(s).

Return type float, list

beta2 (wavelength)
The second derivative of the propagation constant with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns The propagation constant at the target wavelength(s).

Return type float, list

convertWavelengthUnitsNm ()

eps (wavelength=None)
The permittivity of the desired material.

Parameters wavelength (float, list, None) – The wavelength the permittivity will be evaluated at.

Returns The permittivity at the target wavelength.

Return type float, list

gvd (wavelength)
The group velocity dispersion (GVD) with respect to wavelength.

Parameters wavelength (float, list, None) – The wavelength(s) the GVD will be evaluated at.

Returns The GVD at the target wavelength(s).

Return type float, list

n (wavelength=None)
The refractive index of the desired material.

Parameters wavelength (float, list, None) – The wavelength the refractive index will be evaluated at.
Returns The refractive index at the target wavelength.

Return type float, list

\textbf{\texttt{nDer1}(wavelength)}

The first derivative of the refractive index with respect to wavelength.

\textbf{Parameters} \texttt{wavelength(float, list, None)} – The wavelength(s) the derivative will be evaluated at.

\textbf{Returns} The refractive index at the target wavelength(s).

\textbf{Return type} float, list

\textbf{\texttt{nDer2}(wavelength)}

The second derivative of the refractive index with respect to wavelength.

\textbf{Parameters} \texttt{wavelength(float, list, None)} – The wavelength(s) the derivative will be evaluated at.

\textbf{Returns} The refractive index at the target wavelength(s).

\textbf{Return type} float, list

\textbf{\texttt{ng}(wavelength)}

The group index with respect to wavelength.

\textbf{Parameters} \texttt{wavelength(float, list, None)} – The wavelength(s) the group index will be evaluated at.

\textbf{Returns} The group index at the target wavelength(s).

\textbf{Return type} float, list

\textbf{\texttt{vg}(wavelength)}

The group velocities with respect to wavelength.

\textbf{Parameters} \texttt{wavelength(float, list, None)} – The wavelength(s) the group velocities will be evaluated at.

\textbf{Returns} The group velocities at the target wavelength(s).

\textbf{Return type} float, list

\textbf{\texttt{z0}(wavelength)}

The wave impedance assuming the material is dielectric (not lossy or magnetic).

\textbf{Parameters} \texttt{wavelength(float, list, None)} – The wavelength(s) the propagation constant will be evaluated at.

\textbf{Returns} The impedance of the material.

\textbf{Return type} float, list

\textbf{Tfln}

class \texttt{Tfln}(axis, temperatureCelcius=20.0)

Bases: \texttt{opticalmaterialspy.material.Ln}

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<th>Description</th>
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<td>beta1(wavelength)</td>
<td>The derivative of the propagation constant with respect to wavelength.</td>
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<td>beta2(wavelength)</td>
<td>The second derivative of the propagation constant with respect to wavelength.</td>
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<tr>
<td>convertWavelengthUnitsNm()</td>
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<tr>
<td>eps(wavelength)</td>
<td>The permittivity of the desired material.</td>
</tr>
<tr>
<td>gvd(wavelength)</td>
<td>The group velocity dispersion (GVD) with respect to wavelength.</td>
</tr>
<tr>
<td>n(wavelength)</td>
<td>The refractive index of the desired material.</td>
</tr>
<tr>
<td>nDer1(wavelength)</td>
<td>The first derivative of the refractive index with respect to wavelength.</td>
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<td>The second derivative of the refractive index with respect to wavelength.</td>
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<tr>
<td>ng(wavelength)</td>
<td>The group index with respect to wavelength.</td>
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<td>vg(wavelength)</td>
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<tr>
<td>z0(wavelength)</td>
<td>The wave impedance assuming the material is dielectric (not lossy or magnetic).</td>
</tr>
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</table>

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**beta0 (wavelength)**

The propagation constant with respect to wavelength.

- **Parameters**
  - wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

- **Returns**
  - The propagation constant at the target wavelength(s).

- **Return type**
  - float, list

**beta1 (wavelength)**

The derivative of the propagation constant with respect to wavelength.

- **Parameters**
  - wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

- **Returns**
  - The propagation constant at the target wavelength(s).

- **Return type**
  - float, list

**beta2 (wavelength)**

The second derivative of the propagation constant with respect to wavelength.

- **Parameters**
  - wavelength (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

- **Returns**
  - The propagation constant at the target wavelength(s).

- **Return type**
  - float, list

**convertWavelengthUnitsNm()**

**eps (wavelength=None)**

The permittivity of the desired material.

- **Parameters**
  - wavelength (float, list, None) – The wavelength the permittivity will be evaluated at.
Returns The permittivity at the target wavelength.

Return type float, list

\textbf{gvd}(\textit{wavelength})

The group velocity dispersion (GVD) with respect to wavelength.

**Parameters** \textbf{wavelength} (\textit{float, list, None}) – The wavelength(s) the GVD will be evaluated at.

**Returns** The GVD at the target wavelength(s).

**Return type** float, list

\textbf{n}(\textit{wavelength=None})

The refractive index of the desired material.

**Parameters** \textbf{wavelength} (\textit{float, list, None}) – The wavelength the refractive index will be evaluated at.

**Returns** The refractive index at the target wavelength.

**Return type** float, list

\textbf{nDer1}(\textit{wavelength})

The first derivative of the refractive index with respect to wavelength.

**Parameters** \textbf{wavelength} (\textit{float, list, None}) – The wavelength(s) the derivative will be evaluated at.

**Returns** The refractive index at the target wavelength(s).

**Return type** float, list

\textbf{nDer2}(\textit{wavelength})

The second derivative of the refractive index with respect to wavelength.

**Parameters** \textbf{wavelength} (\textit{float, list, None}) – The wavelength(s) the derivative will be evaluated at.

**Returns** The refractive index at the target wavelength(s).

**Return type** float, list

\textbf{ng}(\textit{wavelength})

The group index with respect to wavelength.

**Parameters** \textbf{wavelength} (\textit{float, list, None}) – The wavelength(s) the group index will be evaluated at.

**Returns** The group index at the target wavelength(s).

**Return type** float, list

\textbf{vg}(\textit{wavelength})

The group velocities with respect to wavelength.

**Parameters** \textbf{wavelength} (\textit{float, list, None}) – The wavelength(s) the group velocities will be evaluated at.

**Returns** The group velocities at the target wavelength(s).

**Return type** float, list

\textbf{z0}(\textit{wavelength})

The wave impedance assuming the material is dielectric (not lossy or magnetic).
Parameters: \texttt{wavelength} (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns: The impedance of the material.

Return type: float, list

\texttt{TiO2}

class \texttt{TiO2} (axis)

Bases: \texttt{opticalmaterialspy._material_base._Material}

\textbf{Methods Summary}

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<td>\texttt{beta1(wavelength)}</td>
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<td>\texttt{convertWavelengthUnitsNm()}</td>
<td></td>
</tr>
<tr>
<td>\texttt{eps([wavelength])}</td>
<td>The permittivity of the desired material.</td>
</tr>
<tr>
<td>\texttt{gvd(wavelength)}</td>
<td>The group velocity dispersion (GVD) with respect to wavelength.</td>
</tr>
<tr>
<td>\texttt{n([wavelength])}</td>
<td>The refractive index of the desired material.</td>
</tr>
<tr>
<td>\texttt{nDer1(wavelength)}</td>
<td>The first derivative of the refractive index with respect to wavelength.</td>
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<td>\texttt{nDer2(wavelength)}</td>
<td>The second derivative of the refractive index with respect to wavelength.</td>
</tr>
<tr>
<td>\texttt{ng(wavelength)}</td>
<td>The group index with respect to wavelength.</td>
</tr>
<tr>
<td>\texttt{vg(wavelength)}</td>
<td>The group velocities with respect to wavelength.</td>
</tr>
<tr>
<td>\texttt{z0(wavelength)}</td>
<td>The wave impedance assuming the material is dielectric (not lossy or magnetic).</td>
</tr>
</tbody>
</table>

\textbf{Methods Documentation}

\texttt{beta0(wavelength)}

The propagation constant with respect to wavelength.

Parameters: \texttt{wavelength} (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns: The propagation constant at the target wavelength(s).

Return type: float, list

\texttt{beta1(wavelength)}

The derivative of the propagation constant with respect to wavelength.

Parameters: \texttt{wavelength} (float, list, None) – The wavelength(s) the propagation constant will be evaluated at.

Returns: The propagation constant at the target wavelength(s).

Return type: float, list
**beta2** *(wavelength)*

The second derivative of the propagation constant with respect to wavelength.

**Parameters**
- **wavelength** *(float, list, None)* – The wavelength(s) the propagation constant will be evaluated at.

**Returns**
The propagation constant at the target wavelength(s).

**Return type**
float, list

**convertWavelengthUnitsNm** ()

**eps** *(wavelength=None)*

The permittivity of the desired material.

**Parameters**
- **wavelength** *(float, list, None)* – The wavelength the permittivity will be evaluated at.

**Returns**
The permittivity at the target wavelength.

**Return type**
float, list

**gvd** *(wavelength)*

The group velocity dispersion (GVD) with respect to wavelength.

**Parameters**
- **wavelength** *(float, list, None)* – The wavelength(s) the GVD will be evaluated at.

**Returns**
The GVD at the target wavelength(s).

**Return type**
float, list

**n** *(wavelength=None)*

The refractive index of the desired material.

**Parameters**
- **wavelength** *(float, list, None)* – The wavelength the refractive index will be evaluated at.

**Returns**
The refractive index at the target wavelength.

**Return type**
float, list

**nDer1** *(wavelength)*

The first derivative of the refractive index with respect to wavelength.

**Parameters**
- **wavelength** *(float, list, None)* – The wavelength(s) the derivative will be evaluated at.

**Returns**
The refractive index at the target wavelength(s).

**Return type**
float, list

**nDer2** *(wavelength)*

The second derivative of the refractive index with respect to wavelength.

**Parameters**
- **wavelength** *(float, list, None)* – The wavelength(s) the derivative will be evaluated at.

**Returns**
The refractive index at the target wavelength(s).

**Return type**
float, list

**ng** *(wavelength)*

The group index with respect to wavelength.

**Parameters**
- **wavelength** *(float, list, None)* – The wavelength(s) the group index will be evaluated at.
Returns The group index at the target wavelength(s).

Return type float, list

\textbf{vg} (\textit{wavelength})
The group velocities with respect to wavelength.

Parameters \textbf{wavelength} (\textit{float, list, None}) – The wavelength(s) the group velocities will be evaluated at.

Returns The group velocities at the target wavelength(s).

Return type float, list

\textbf{z0} (\textit{wavelength})
The wave impedance assuming the material is dielectric (not lossy or magnetic).

Parameters \textbf{wavelength} (\textit{float, list, None}) – The wavelength(s) the propagation constant will be evaluated at.

Returns The impedance of the material.

Return type float, list
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