
physdata Documentation

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CHAPTER 1

xray

xray.py: A module to interface the [X-Ray Mass Attenuation Coefficients](#) data.

class physdata.xray.CompoundData (row, short_name)

An composite material in the database.

short_name

str – Short name of the material.

name

str – Name of the material.

mass_ratio

float – Mean atomic number-mass ratio $\langle Z/A \rangle$.

excitation

float – Mean excitation energy in eV.

density

float – Density in g/cm^3 .

Note: Some density values are only nominal, according to the data.

class physdata.xray.ElementData (row)

An element in the database.

z

int – The atomic number.

symbol

str – Symbol of the element.

name

str – Name of the element.

mass_ratio

float – Atomic number-mass ratio Z/A .

excitation

float – Mean excitation energy in eV.

density

float – Density in g/cm³.

Note: Some density values are only nominal, according to the data. Values for Z=85 and 87 were arbitrarily set to 10.

`physdata.xray.fetch_coefficients(z, density=None, border_separation=1e-08)`

Fetch from the website the data for an element or compound.

Parameters

- **z** (*int or str*) – The atomic number (element) or a string representing the compound.
- **density** (*float, optional*) – If given, the density scaling is removed.
- **border_separation** (*float*) – An amount in MeV to split the absorption edges in the data. If the value was so big it would overlap another energy interval, it will be reduced with a warning.

Returns

a list with the data for each tabulated energy value, each a list with:

- (float): Energy in MeV.
- (float): Attenuation coefficient in cm²/g or in cm⁻¹ if a density was given.
- (float): Energy absorption coefficient in cm²/g or in cm⁻¹ if a density was given.

Return type List

`physdata.xray.fetch_compounds()`

Fetch the compound data from the NIST database.

Returns A list with the info of each compound available.

Return type List[*CompoundData*]

`physdata.xray.fetch_elements()`

Fetch the element data from the NIST database.

Returns A list with the info of each element available.

Return type List[*ElementData*]

star.py: A module to interface the [Stopping-Power & Range Tables for Electrons, Protons, and Helium Ions](#).

`physdata.star.fetch_astar(el_id, density=None)`

Fetch from the website the data for alpha particles in a medium.

Check the [STAR appendix](#) for further details.

Parameters

- **el_id** (*int*) – The positive integer identifying the medium.
- **density** (*float or bool, optional*) – If given, the density scaling is removed. If it is the boolean True, the
- **will be taken from the website.** (*density*) –

Returns

a list of lists, a list with the data for each tabulated energy value, each a list with:

- (float): Kinetic energy in MeV.
- (float): Electronic stopping power in MeV cm²/g or in MeV/cm if a density was given.
- (float): Nuclear stopping power in MeV cm²/g or in MeV/cm if a density was given.
- (float): Total stopping power in MeV cm²/g or in MeV/cm if a density was given.
- (float): CSDA range in g/cm² or in cm if a density was given.
- (float): Projected CSDA range in g/cm² or in cm if a density was given.
- (float): Detour factor (projected CSDA / CSDA).

Return type (list)

`physdata.star.fetch_estar(el_id, density=None)`

Fetch from the website the data for electrons in a medium.

Check the [STAR appendix](#) for further details.

Parameters

- **el_id** (*int*) – The positive integer identifying the medium.
- **density** (*float or bool, optional*) – If given, the density scaling is removed. If it is the boolean True, the density will be taken from the website.

Returns

a list of lists, a list with the data for each tabulated energy value, each a list with:

- (float): Kinetic energy in MeV.
- (float): Collision stopping power in MeV cm²/g or in MeV/cm if a density was given.
- (float): Radiative stopping power in MeV cm²/g or in MeV/cm if a density was given.
- (float): Total stopping power in MeV cm²/g or in MeV/cm if a density was given.
- (float): CSDA range in g/cm² or in cm if a density was given.
- (float): Radiation yield (fraction of kinetic energy converted into bremsstrahlung).
- (float): Density effect parameter

Return type (list)

`physdata.star.fetch_pstar(el_id, density=None)`

Fetch from the website the data for protons in a medium.

Check the [STAR appendix](#) for further details.

Parameters

- **el_id** (*int*) – The positive integer identifying the medium.
- **density** (*float or bool, optional*) – If given, the density scaling is removed. If it is the boolean True, the
- **will be taken from the website.** (*density*) –

Returns

a list of lists, a list with the data for each tabulated energy value, each a list with:

- (float): Kinetic energy in MeV.
- (float): Electronic stopping power in MeV cm²/g or in MeV/cm if a density was given.
- (float): Nuclear stopping power in MeV cm²/g or in MeV/cm if a density was given.
- (float): Total stopping power in MeV cm²/g or in MeV/cm if a density was given.
- (float): CSDA range in g/cm² or in cm if a density was given.
- (float): Projected CSDA range in g/cm² or in cm if a density was given.
- (float): Detour factor (projected CSDA / CSDA).

Return type (list)

CHAPTER 3

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