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# **pyPAHdb Documentation**

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## INTRODUCTION

This is the Nasa Ames...



## PYPAHDB PACKAGE

## 2.1 Subpackages

### 2.1.1 pypahdb.tests package

#### Submodules

##### pypahdb.tests.test\_observation module

test\_observation.py: unit tests for class observation.

```
class pypahdb.tests.test_observation.SpectrumTestCase (methodName='runTest')  
    Bases: unittest.case.TestCase  
  
    Unit tests for observation.py  
  
    test_is_instance()  
        Can we create an instance of observation?
```

##### pypahdb.tests.test\_spectrum module

test\_spectrum.py: unit tests for class spectrum.

```
class pypahdb.tests.test_spectrum.SpectrumTestCase (methodName='runTest')  
    Bases: unittest.case.TestCase  
  
    Unit tests for spectrum.py  
  
    test_convert_units_micron_to_wavenumber()  
        Can we correctly convert micron to wavenumber?  
  
    test_is_instance()  
        Can we create an instance of spectrum?
```

##### pypahdb.tests.test\_writer module

test\_writer.py: unit tests for class writer.

```
class pypahdb.tests.test_writer.WriterTestCase (methodName='runTest')  
    Bases: unittest.case.TestCase  
  
    Unit tests for writer.py
```

```
test_is_instance()
```

Can we create an instance of writer?

## Module contents

unit tests for pypahdb

## 2.2 Submodules

### 2.3 pypahdb.decomposer module

decomposer.py: Using a precomputed matrix of theoretically calculated PAH emission spectra a spectrum is decomposed into contribution PAH subclasses using a nnls-approach.

This file is part of pypahdb - see the module docs for more information.

```
class pypahdb.decomposer.decomposer(spectrum)
```

Bases: object

Decomposes a spectrum with PAHdb.

**spectrum**

The decomposed spectrum.

**charge**

Return the spectral charge breakdown.

**Returns** returns array

**fit**

Return the fitted spectra.

**Returns** returns array

**ionized\_fraction**

Return the ionized fraction.

**Returns** returns array

**large\_fraction**

Return the large fraction.

**Returns** returns array

**size**

Return the spectral size breakdown.

**Returns** returns array

### 2.4 pypahdb.observation module

observation.py: Holds and astronomical observation

This file is part of pypahdb - see the module docs for more information.



```
class pypahdb.observation.observation (file_path)
    Bases: object

    Creates an observation object.

    Currently reads ASCII data and Spitzer-IRS data cubes.

    spectrum
        spectrum – contains loaded spectrum
```

## 2.5 pypahdb.spectrum module

spectrum.py: Holds a spectrum

This file is part of pypahdb - see the module docs for more information.

```
class pypahdb.spectrum.spectrum (abscissa, ordinate, uncertainties, units)
    Bases: object

    Create a spectrum object.

    abscissa
        numpy.ndarray – The abscissa values.

    ordinate
        numpy.ndarray – The ordinate values.

    uncertainties
        numpy.ndarray – Uncertainties on the ordinate.

    units
        list – The units.

    convertunitsto (**keywords)
        Convert units.

        Parameters

        • aunits (str) – The new abscissa units.

        • ounits (str) – The new ordinate units.

    Returns Nothing.
```

## 2.6 pypahdb.writer module

writer.py: Writes decomposer results to file

This file is part of pypahdb - see the module docs for more information.

```
class pypahdb.writer.writer (result, header="", basename="", opdf=True, ofits=True)
    Bases: object

    Creates a writer object.

    Writes PDF and FITS files.

    Attributes:
```

## 2.7 Module contents

The pyPAHdb package is being developed as part of the awarded James Webb Space Telescope (JWST) Early Release Science (ERS) program “Radiative Feedback from Massive Stars as Traced by Multiband Imaging and Spectroscopic Mosaics” (ID: 1288). The entire program is coordinated by an international “Core team” of 19 scientists and supported by 119 “science collaborators”. pyPAHdb is developed by the NASA Ames PAH IR Spectroscopic Database team, associated with the Astrophysics & Astrochemistry Laboratory at NASA Ames Research Center.

pyPAHdb uses a precomputed matrix of theoretically calculated PAH emission spectra from version 3.00 of the library of computed spectra. This matrix has been constructed from a collection of “astronomical” PAHs, which meet the following criteria and include the fullerenes C60 and C70:

`‘magnesium=0 oxygen=0 iron=0 silicium=0 chx=0 ch2=0 c>20 hydrogen>0’`

The PAH emission spectra have been calculated with the following parameters:

- A calculated vibrational temperature upon the absorption of a 7 eV photon
- Blackbody emission at the calculated vibrational temperature
- A redshift of 15 /cm to mimic some anharmonic effect
- Gaussian emission profile with a FWHM of 15 /cm

The NASA Ames PAH IR Spectroscopic Database website is located at [www.astrochemistry.org/pahdb/](http://www.astrochemistry.org/pahdb/).

You are kindly asked to cite the following papers when using pyPAHdb:

- C.W. Bauschlicher, Jr., A. Ricca, C. Boersma, and L.J. Allamandola, “THE NASA AMES PAH IR SPECTROSCOPIC DATABASE: COMPUTATIONAL VERSION 3.00 WITH UPDATED CONTENT AND THE INTRODUCTION OF MULTIPLE SCALING FACTORS”, The Astrophysical Journal Supplement Series, 234, 32, 2018 10.3847/1538-4365/aaa019
- C. Boersma, C.W. Bauschlicher, Jr., A. Ricca, A.L. Mattioda, J. Cami, E. Peeters, F. Sanchez de Armas, G. Puerta Saborido, D.M. Hudgins, and L.J. Allamandola, “THE NASA AMES PAH IR SPECTROSCOPIC DATABASE VERSION 2.00: UPDATED CONTENT, WEBSITE AND ON/OFFLINE TOOLS”, The Astrophysical Journal Supplement Series, 211, 8, 2014 10.1088/0067-0049/211/1/8
- Mattioda, A. L., Hudgins, D. M., Boersma, C., Ricca, A., Peeters, E., Cami, J., Sanchez de Armas, F., Puerta Saborido, G., Bauschlicher, C. W., J., and Allamandola, L. J. “THE NASA AMES PAH IR SPECTROSCOPIC DATABASE: THE LABORATORY SPECTRA”, The Astrophysical Journal Supplement Series, XXX, 201X (in preparation)

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