Package 'ezmmek'

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Type Package

Title Analysis of Enzyme Activities on Synthetic Substrates using Michaelis-Menten Kinetics

Version 0.2.1

Author Christopher L. Cook and Andrew D. Steen

Maintainer Christopher L. Cook <ccook62@vols.utk.edu>

Description
Analysis of enzyme activities on fluorogenic and chromogenic substrates using Michaelis-Menten kinetics. It outputs plots and relevant statistics regarding standard curves and saturation curves. It also enables the user to customize plots to their particular datasets.
This package is based on concepts described in: German et al. (2011) <doi:10.1016/j.soilbio.2011.03.017>, Sinsabaugh et al. (2014) <doi:10.1007/s10533-014-0030-y>, and Steen and Arnosti (2011) <doi:10.1016/j.marchem.2010.10.006>.

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Suggests testthat

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R topics documented:

`d_sat` *Saturation curve data*

Description

Sample saturation curve data featuring time, conc. of substrate, replicate #, and spectral data.

Usage

```
data(d_sat)
```

Author(s)

Christopher L. Cook and Andrew D. Steen

`d_sat_n` *Saturation curve data, normalized*

Description

Saturation curve data featuring time, conc. of substrate, replicate #, spectral data, and normalization factor.

Usage

```
data(d_sat_n)
```

Author(s)

Christopher L. Cook and Andrew D. Steen

d_std *Standard curve data*

Description

Sample standard curve data featuring spectral data and conc. of standard.

Usage

```
data(d_std)
```

Author(s)

Christopher L. Cook and Andrew D. Steen

p_sat_curve *Create saturation curve*

Description

Creates a dataframe and plot by applying the standard curve coefficients to the raw saturation data.

Usage

```
p_sat_curve(d_std, d_sat, man.units = FALSE)
```

Arguments

d_std	Must be a dataframe that contains 'std.conc' and 'spec'.
d_sat	Must be a dataframe that contains 'time', 'sub.conc' (substrate concentration), 'replicate', and 'spec' (spectral data). If d_sat contains a fifth column, that fifth column will be assumed to be a normalization factor. The rate of reacation will be divided by the values present in the fifth column. The user will be prompted to name the unit of normalization, which will appear on the y-axis, if a fifth column is present.
man.units	If 'man.units = TRUE', the user will be guided through a series of prompts to label the plot axes. If 'man.units = FALSE', a plot will generated with generic axes titles.

Details

The spectral data is converted to concentration of standard. The new dataframe contains the average slope (rate of reaction) and standard deviation for each replicate at each substrate concentration. 'p_sat_curve' plots the new dataframe with substrate concentration on the x-axis, and rate of reaction on the y-axis. It asks the user to specify axis labels with the appropriate units. It predicts and reports Vmax and Km values. It creates a list output containing the new dataframe, an additional new dataframe consisting of predicted curve fit values, the regression model, and the saturation curve plot.

Value

List containing new dataframe, regression model, and saturation curve.

Author(s)

Christopher L. Cook and Andrew D. Steen

Examples

```
#If 'man.units = FALSE'
p_sat_curve(d_std, d_sat)
p_sat_curve(d_std, d_sat_n)

#If 'man.units = TRUE'
#Run 'p_sat_curve(d_std, d_sat)'.
#When prompted 'Substrate name:', type 'L-Leucine AMC' and press Enter.
#When prompted 'x-axis: What are the units of substrate concentration?', type '3' and press Enter.
#When prompted 'y-axis: What are the units of concentration?', type '3' and press Enter.
#When prompted 'y-axis: What are the units of time?', type '2' and press Enter.

#If 'man.units = TRUE'
#Run 'p_sat_curve(d_std, d_sat_n)'.
#When prompted 'Substrate name:', type 'L-Leucine AMC' and press Enter.
#When prompted 'x-axis: What are the units of substrate concentration?', type '3' and press Enter.
#When prompted 'y-axis: What are the units of concentration?', type '3' and press Enter.
#When prompted 'y-axis: What are the units of time?', type '2' and press Enter.
#When prompted 'Normalization unit:', type 'cell' and press Enter.
```

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p_sat_raw *Create plot of raw data*

Description

Creates plot of raw saturation data.

Usage

```
p_sat_raw(d_sat, man.units = FALSE)
```

Arguments

d_sat	Must be a dataframe that contains 'time', 'sub.conc' (substrate concentration), 'replicate', and 'spec' (spectral data).
man.units	If 'man.units = TRUE', the user will be guided through a series of prompts to label the plot axes. If 'man.units = FALSE', a plot will generated with generic axes titles.

Details

Plots raw saturation curve data into separate facets based on substrate concentration ('sub.conc'). It asks the user to specify the axis labels with the appropriate units. It creates a list output containing the raw data plot.

Value

List containing plot.

Author(s)

Christopher L. Cook and Andrew D. Steen

Examples

```
#If 'man.units = FALSE'
p_sat_raw(d_sat)

#If 'man.units = TRUE'
#Run 'p_sat_raw(d_sat)'.
#When prompted 'x-axis: What are the units of time?', type '2' and press Enter.
#When prompted 'y-axis: Detection Unit?:', type 'FSU' and press Enter.
```

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p_std_curve *Create standard curve*

Description

Creates a standard curve of spectral data versus fluorophore/chromophore concentration.

Usage

```
p_std_curve(d_std, man.units = FALSE)
```

Arguments

d_std	Must be a dataframe that contains 'std.conc' and 'spec'.
man.units	If 'man.units = TRUE', the user will be guided through a series of prompts to label the plot axes. If 'man.units = FALSE', a plot will generated with generic axes titles.

Details

Plots spectral data vs standard concentration. It asks the user to specify the axis labels with the appropriate units. It reports linear model summary statistics. It creates a list output containing the summary statistics and standard curve plot.

Value

List containing plot and fit model.

Author(s)

Christopher L. Cook and Andrew D. Steen

Examples

```
#If 'man.units = FALSE'
p_std_curve(d_std, man.units = FALSE)

#If 'man.units = TRUE'
#Run 'p_std_curve(d_std)'.
#When prompted 'Standard type:', type 'AMC' and press Enter.
#When prompted 'x-axis: What are the units of concentration?', type '3' and press Enter.
#When prompted 'y-axis: Detection unit?:', type 'FSU' and press Enter.
```

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