Package 'PUPAIM'

February 18, 2019

Type Package

Title 'A Collection of Physical and Chemical Adsorption Isotherm Models'

Version 0.1.0

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Description Adsorption isotherm equations are linearized plots of different solid-liquid phase equilibria used in calculating different parameters related to the adsorption process. Isotherm equations deals with physical adsorption of gases and vapor and gives the most important characteristics of industrial adsorbents that include pore volume, pore size or energy distribution. PUPAIM has 28 documented adsorption isotherm models listed by Dabrowski (2001) <doi:10.1016/S0001-8686(00)00082-8> and Ayawei et al.(2017) <doi:10.1155/2017/3039817>. These models could be easily fitted in R using adsorption data (Ce and Qe) obtained from experiments.

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Encoding UTF-8

LazyData true

RoxygenNote 6.1.1

Depends R(>= 3.4.0)

Imports FSA, Metrics, minpack.lm, stats, graphics

NeedsCompilation no

Repository CRAN

Date/Publication 2019-02-18 09:40:10 UTC

R topics documented:

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banana *Banana Adsorption study*

Description

Adsorption of Copper(II) using Musa acuminata x balbisiana seeds as bioadsorbent

Usage

```
data("banana")
```

Format

A data frame with 6 observations on the following 2 variables.

Ce a numeric vector for the equilibrium concentration

Qe a numeric vector for the adsorbed concentration

Source

Development of an R package for chemical adsorption isotherms, kinetics and thermodynamics(2019), BS Chemistry thesis , Polytechnic University of the Philippines

bauduanalysis *Baudu Isotherm Analysis*

Description

Reduced form of Langmuir Isotherm

Usage

```
bauduanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Baudu isotherm

Examples

```
bauduanalysis(c(1,2,3,4,5),c(1,2,3,4,5))
```

bauduplot *Baudu Isotherm Plot*

Description

Plot of the analysis of Baudu Isotherm

Usage

```
bauduplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the LSRL plot of Baudu isotherm analysis @export

BETanalysis *BET Isotherm Analysis*

Description

An isotherm that takes account of the possibility that the monolayer in the Langmuir adsorption isotherm can act as a substrate for further adsorption.

Usage

```
BETanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilbrium concentration
Qe	the numerical value for the adsorbed concentration

Value

the Linear model for the BET isotherm analysis

betplot *BET Isotherm Plot*

Description

Plot of the analysis of BET Isotherm

Usage

```
betplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the plot for the BET adsorption isotherm

Examples

```
betplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

deltaG *Gibbs free energy of Adsorption*

Description

Defines the spontaneity of an adsoprtion process base from the value. If it is negative is is spontaneous and if the result is positive,the reaction is not spontaneous.

Usage

```
deltaG(t, K)
```

Arguments

t	temperature used in the experiment
K	equilirium constant for the adsorption process

Value

the Gibbs free energy value for the given adsorption process in terms of Kj(kilojoule) per mole

Examples

```
deltaG(25,1234)
```

drplot *Dubinin-Radushkevich Isotherm Plot*

Description

Plot of the analysis of Dubinun-Radushkevich Isotherm

Usage

```
drplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the LSRL plot of Dubinin-Radushkevich isotherm analysis

Examples

```
drplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

dubininradanalysis *Dubinin Radushkevich Isotherm Analysis*

Description

It is only suitable for intermediate range of adsorbate concentrations because it exhibits unrealistic asymptotic behavior and does not predict Henry's laws at low pressure.

Usage

```
dubininradanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Dubinin Radushkevich isotherm analysis

Examples

```
dubininradanalysis (c(1,2,3,4,5),c(1,2,3,4,5))
```

elovichanalysis *Elovich Isotherm Analysis*

Description

The equation that defines this model is based on a kinetic principle which assumes that adsorption sites increase exponentially with adsorption; this implies a multilayer adsorption.

Usage

```
elovichanalysis(Qe, Ce)
```

Arguments

Qe	The numeric value for the equilibrium concentration
Ce	the numeric value for the adsorbed concentration

Value

the regression analysis for the Elovich Isotherm analysis

Examples

```
elovichanalysis(c(1,2,3,4,5),c(1,2,3,4,5))
```

---

elovichkinetics *Elovich Kinetics*

Description

This equation assumes that the actual solid surfaces are energetically heterogenous and that neither desorption nor interactions betwen adsorbed species could subcutaneously affect the kinetics of adsorption at low surface coverage. (Mercado-Borayo, et. al, 2014)

Usage

```
elovichkinetics(t, Qt)
```

Arguments

t	duration for the experiment
Qt	the numerical value for the concentration at given time

Value

The regression analysis for the Elovich Kinetics

---

elovichplot *Elovich Isotherm Plot*

Description

Plot of the analysis of Elovich Isotherm

Usage

```
elovichplot(Qe, Ce)
```

Arguments

Qe	the numerical value for the adsorbed capacity
Ce	the numerical value for the equilibrium capacity

Value

the LSRL plot for Elovich isotherm analysis

Examples

```
elovichplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

fgplot *Fowler Guggenheim Isotherm Plot*

Description

Plot of the analysis of Fowler Guggenheim Isotherm

Usage

```
fgplot(theta, Ce)
```

Arguments

theta	the numerical value for the fractional coverage
Ce	the numerical value for the equilibrium concentration

Value

the LSRL plot for Flory Huggins isotherm analysis

Examples

```
fgplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

fhanalysis *Flory Huggins Isotherm Analysis*

Description

Flory Huggins Isotherm Analysis

Usage

```
fhanalysis(theta, Co)
```

Arguments

theta	the numeric value for the fractional coverage
Co	the numeric value for the initial concentration

Value

the regression analysis for the Flory Huggins Isotherm

fhplot *Flory Huggins Isotherm Plot*

Description

Plot of the analysis of Flory Huggins

Usage

```
fhplot(Ce, theta)
```

Arguments

Ce	the numerical value for the equilibrium capacity
theta	the numerical value for the fractional coverage

Value

the LSRL plot for Flory Huggins isotherm analysis

firstorder *Pseudo-1st Order Kinetics*

Description

A first-order rate equation which is believed to be the earliest model that was presented by Lagergen (1898) to describe the kinetic process of liqud-solid phase adsorption of oxalic acid and malonic acid onto charcoal pertains to the adsorption rate based on the adsorption capacity.

Usage

```
firstorder(t, Ce)
```

Arguments

t	duration of the experiment
Ce	the numerical value for the equilibrium capacity

Value

the regression analysis for the first order kinetics

Examples

```
firstorder(c(1,2,3,4,5),c(1,2,3,4,5))
```

fiveparamanalysis *Five Parameter Isotherm Analysis*

Description

A five-parameter empirical model that is capable of simulating the model variations more precisely for application over a wide range of equilibrium data.

Usage

```
fiveparamanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the five parameter isotherm analysis

Examples

```
fiveparamanalysis(moringa$Ce,moringa$Qe)
```

fivePplot *Five Parameter Isotherm Plot*

Description

Plot of the analysis of Five Parameter Isotherm

Usage

```
fivePplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Five parameter isotherm analysis

Examples

```
fivePplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

fowlerganalysis *Fowler Guggenheim Isotherm*

Description

This isotherm equation which takes into consideration the lateral interaction of the adsorbed molecules.

Usage

```
fowlerganalysis(theta, Ce)
```

Arguments

theta	the numerical value reperesenting the fractional coverage
Ce	the numerical value fot the equilibrium capacity

Value

the linear regression and the parameters for the Fowler Guggenheim isotherm analysis

Examples

```
fowlerganalysis(c(1,2,3,4,5),c(1,2,3,4,5))
```

freundlichanalysis *Freundlich Isotherm Analysis*

Description

Gives an expression which defines the surface heterogeneity and the exponential distribution of active sites and their energies

Usage

```
freundlichanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the regression analysis for the freundlich isotherm analysis

Examples

```
freundlichanalysis(c(1,2,3,4,5),c(1,2,3,4,5))
```

freundlichplot *Title*

Description

Title

Usage

```
freundlichplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the plot for the freundlich adsorption isotherm

Examples

```
freundlichplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

fritzanalysis *Fritz Schlunder Isotherm Analysis*

Description

An empirical equation which can fit a wide range of experimental results because of the large number of coefficients in the isotherm.

Usage

```
fritzanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Fritz Schlunder isotherm analysis

Examples

```
fritzanalysis(moringa$Ce,moringa$Qe)
```

fsplot *Fritz Schlunder Isotherm Plot*

Description

Plot of the analysis of Fritz Schlunder Isotherm

Usage

```
fsplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the LSRL plot fot Fritz Schlunder isotherm analysis

Examples

```
fsplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

halseyanalysis *Halsey Isotherm*

Description

Used to evaluate multilayer adsorption at a relatively large distance from the surface.

Usage

```
halseyanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Halsey isotherm analysis

halseyplot *Halsey Isotherm Plot*

Description

Plot of the analysis of Halsey Isotherm

Usage

```
halseyplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the LSRL plot for Halsey isotherm analysis

Examples

```
halseyplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

harkinsjuraanalysis *HarkinsJura Isotherm*

Description

It assumes the possibility of multilayer adsorption on the surface of absorbents having heterogeneous pore distribution.

Usage

```
harkinsjuraanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Harkins Jura isotherm analysis

Examples

```
harkinsjuraanalysis(c(1,2,3,4,5),c(1,2,3,4,5))
```

hdplot *Hill Deboer Isotherm*

Description

Plot of the analysis of Hill Deboer Isotherm

Usage

```
hdplot(theta, Ce)
```

Arguments

theta	a numeric vector consists of fractional coverage
Ce	a numeric vector consists of equilibrium concentration

Value

the LSRL plot for Hill Deboer isotherm

Examples

```
hdplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

henryanalysis *Henry Isotherm*

Description

It describes an appropriate fit to the adsorption of adsorbate at relatively low concentrations such that all adsorbate molecules are secluded from their nearest neighbours.

Usage

```
henryanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Henry isotherm analysis

Examples

```
henryanalysis(c(1,2,3,4,5),c(1,2,3,4,5))
```

henryanalysisplot *Henry Isotherm Plot*

Description

Plot of the analysis of Henry Isotherm

Usage

```
henryanalysisplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the LSRL plot for Henry isotherm analysis

Examples

```
henryanalysisplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

hillanalysis *Hill Isotherm*

Description

Hill Isotherm

Usage

```
hillanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Hill isotherm analysis

Examples

```
hillanalysis(c(1,2,3,4,5),c(1,2,3,4,5))
```

hilldeboeranalysis *Hill Deboer Isotherm Analysis*

Description

Describes an incident where there is mobile adsorption as well as lateral interaction among adsorbed molecules.

Usage

```
hilldeboeranalysis(theta, Ce)
```

Arguments

theta	the numerical value representing the fractional coverage
Ce	the numerical value for the equilibrium capacity

Value

the linear regression and the parameters for the Hill Deboer isotherm analysis

Examples

```
hilldeboeranalysis(c(1,2,3,4,5),c(1,2,3,4,5))
```

hillplot *Hill Isotherm Plot*

Description

Plot of the analysis of Hill Isotherm

Usage

```
hillplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the LSRL plot for Hill isotherm analysis

Examples

```
hillplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

hjplot *Harkins- Jura Isotherm Plot*

Description

Plot of the analysis of Harkins-Jura Isotherm

Usage

```
hjplot(Ce, Qe)
```

Arguments

Ce	the numerical value for a equilbrium concentration
Qe	the numerical value for the adsorbed quantities

Value

the LSRL plot for the Harkins Jura Isotherm

Examples

```
hjplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

jossensanalysis *Jossens Isotherm*

Description

It predicts a simple equation based on the energy distribution of adsorbate-adsorbent interactions at adsorption sites.This model assumes that the adsorbent has heterogeneous surface with respect to the interactions it has with the adsorbate.

Usage

```
jossensanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Jossens isotherm analysis

Examples

```
jossensanalysis(c(1,2,3,4,5),c(1,2,3,4,5))
```

---

jossensplot *Jossens Isotherm Plot*

Description

Plot of the analysis of Jossens Isotherm

Usage

```
jossensplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the LSRL plot for Jossen's isotherm

Examples

```
jossensplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

---

jovanovicanalysis *Jovanovic Isotherm*

Description

It is predicated on the assumptions contained in the Langmuir model, but in addition the possibility of some mechanical contacts between the adsorbate and adsorbent.

Usage

```
jovanovicanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Jovanovic isotherm analysis

Examples

```
jovanovicanalysis(c(1,2,3,4,5),c(1,2,3,4,5))
```

---

jovanovicplot *Jovanovic Isotherm Plot*

Description

Plot of the analysis of Jovanovic Isotherm

Usage

```
jovanovicplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the LSRL plot for Jovanovic isotherm analysis

Examples

```
jovanovicplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

---

kahnanalysis *Kahn Isotherm*

Description

Kahn Isotherm

Usage

```
kahnanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Kahn isotherm analysis

Examples

```
kahnanalysis(moringa$Ce,moringa$Qe)
```

`kahnplot` *Kahn Isotherm plot*

Description

Plot of the analysis of Kahn Isotherm

Usage

```
kahnplot(Ce, Qe)
```

Arguments

`Ce`	the numerical value for the equilibrium capacity
`Qe`	the numerical value for the adsorbed capacity

Value

the LSRL plot for Kahn isotherm analysis

Examples

```
kahnplot(moringa$Ce,moringa$Qe)
```

`kcarriganplot` *Koble-Carrigan Isotherm Plot*

Description

Plot of the analysis of Koble-Carrigan Isotherm

Usage

```
kcarriganplot(Ce, Qe)
```

Arguments

`Ce`	the numerical value for the equilibrium capacity
`Qe`	the numerical value for the adsorbed capacity

Value

the plot for koble carrigan isotherm analysis

Examples

```
kcarriganplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

---

kiselevanalysis *Kiselev Isotherm Analysis*

Description

Kiselev Isotherm Analysis

Usage

```
kiselevanalysis(Kh, Ce)
```

Arguments

Kh	the numerical value representing Kiselev analysis
Ce	the numerical value for the equilibrium capacity

Value

the linear regression and the parameters for the Kiselev isotherm analysis

Examples

```
kiselevanalysis(c(1,2,3,4,5),c(1,2,3,4,5))
```

---

kiselevplot *Kiselev Isotherm Plot*

Description

Plot of the analysis of Kiselev Isotherm

Usage

```
kiselevplot(Kh, Ce)
```

Arguments

Kh	the numerical value for the kiselev constant
Ce	the numerical value for the equilibrium capacity

Value

the plot for kiselev isotherm analysis

Examples

```
kiselevplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

---

koblecarrigananalysis *Koble Carrigan Isotherm Analysis*

Description

Koble Carrigan Isotherm Analysis

Usage

```
koblecarrigananalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Koble Carrigan isotherm analysis

Examples

```
koblecarrigananalysis(moringa$Ce,moringa$Qe)
```

---

langmuiranalysis *Langmuir Isotherm Analysis*

Description

It was primarily designed to describe gas-solid phase adsorption is also used to quantify and contrast the adsorptive capacity of various adsorbents [12]. Langmuir isotherm accounts for the surface coverage by balancing the relative rates of adsorption and desorption (dynamic equilibrium).

Usage

```
langmuiranalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the regression analysis for the langmuir isotherm analysis

Examples

```
langmuiranalysis(moringa$Ce,moringa$Qe)
```

---

langmuirFanalysis *Langmuir Freundlich Isotherm Analysis*

Description

Langmuir Freundlich Isotherm Analysis

Usage

```
langmuirFanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the analysis for the Langmuir-Freundlich Isotherm

Examples

```
langmuirFanalysis(c(1,2,3,4,5),c(1,2,3,4,5))
```

langmuirFplot *Langmuir-Freundlich Isotherm Plot*

Description

Plot of the analysis of Langmuir-FreundLich Isotherm

Usage

```
langmuirFplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilbrium concentration
Qe	the numerical value for the adsorbed concentration

Value

the LSRL for the Langmuir-Freundlich isotherm analysis

Examples

```
langmuirFplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

langmuirplot *Langmuir Plot*

Description

Langmuir Plot

Usage

```
langmuirplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the plot for the langmuir adsorption isotherm

Examples

```
langmuirplot(moringa$Ce,moringa$Qe)
```

marcJplot *Marckzewski Jaroniec Isotherm Plot*

Description

Plot of the analysis of Marckzewski Jaroniec Isotherm

Usage

```
marcJplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the plot for the Marckzewski Jaroniec isotherm analysis

Examples

```
marcJplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

mjanalysis *Marckzewski Jaroniec Isotherm Analysis*

Description

Marckzewski Jaroniec Isotherm Analysis

Usage

```
mjanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Marckzewski Jaroniec isotherm analysis

moringa *Moringa Adsorption Study*

Description

Adsorption of Copper(II) using Moringa oleifera seeds as bioadsorbent

Usage

```
data("moringa")
```

Format

A data frame with 6 observations on the following 2 variables.

Ce a numeric vector for the equilibrium concentration

Qe a numeric vector for the adsorbed concentration

Source

Development of an R package for chemical adsorption isotherms, kinetics and thermodynamics(2019), BS Chemistry thesis , Polytechnic University of the Philippines

radkePplot *Raudke Prausniiz Isotherm Plot*

Description

Plot of the analysis of Raudke Prausniiz Isotherm

Usage

```
radkePplot(Ce, Qe)
```

Arguments

Ce	Ce the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

Provides the plot for Raudke Prausniiz isotherm model

Examples

```
radkePplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

raudkepanalysis *Raudke Prausniiz Isotherm Analysis*

Description

It has several important properties which makes it more preferred in most adsorption systems at low adsorbate concentration.

Usage

```
raudkepanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Raudke Prausniiz isotherm analysis

Examples

```
raudkepanalysis(moringa$Ce,moringa$Qe)
```

redlichpanalysis *Redlich Peterson Isotherm Analysis*

Description

Redlich Peterson Isotherm Analysis

Usage

```
redlichpanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Redlich Peterson isotherm analysis

Examples

```
redlichpanalysis(moringa$Ce,moringa$Qe)
```

rpplot *Redlich Peterson Isotherm Plot*

Description

Plot of the analysis of Redlich Peterson Isotherm

Usage

```
rpplot(Ce, Qe)
```

Arguments

Ce	Ce the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

Provides the plot for Redlich Peterson isotherm model

Examples

```
rpplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

secondorder *Pseudo-2nd Order Kinetics*

Description

The pseudo-second order model describes the adsorption reaction rate with depndent energetically hetrogenousites on the adsorbent. (Mercado-Borayo, et. al., 2014)

Usage

```
secondorder(t, Ce)
```

Arguments

t	duration of the experiment
Ce	the numerical value for the equilibrium capacity

Value

the regression analysis for the second order kinetics

Examples

```
secondorder(c(1,2,3,4,5),c(1,2,3,4,5))
```

sipsanalysis *Sips Isotherm Analysis*

Description

Sips Isotherm Analysis

Usage

```
sipsanalysis(Qe, Ce)
```

Arguments

Qe	the numerical value for the adsorbed concentration
Ce	the numerical value for the equilbrium concentration

Value

the Linear model for the Sips isotherm analysis

Examples

```
sipsanalysis(c(1,2,3,4,5),c(1,2,3,4,5))
```

sipsplot *Sips Isotherm Plot*

Description

Plot of the analysis of Sips Isotherm

Usage

```
sipsplot(Qe, Ce)
```

Arguments

Qe	the numerical value for the adsorbed concentration
Ce	the numerical value for the equilbrium concentration

Value

the LSRL of Sips analysis

Examples

```
sipsplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

summaryanalysis *Summary of the Iostherm Analysis*

Description

Summarize the analysis for different isotherm models

Usage

```
summaryanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the summary of the linear model for different adsorption isotherm

summaryplots *Summary of Plots of the Isotherm Analysis*

Description

Summarize the plot for different isotherm models

Usage

```
summaryplots(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the summary of the LSRL plot for different adsorption isotherm

temkinanalysis *Temkin Isotherm Analysis*

Description

takes into account the effects of indirect adsorbate/adsorbate interaction on the adsorption process

Usage

```
temkinanalysis(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the linear regression and the parameters for the Temkin Isotherm Analysis

Examples

```
temkinanalysis (c(1,2,3,4,5),c(1,2,3,4,5))
```

temkinplot *Temkin Isotherm Analysis*

Description

takes into account the effects of indirect adsorbate/adsorbate interaction on the adsorption process

Usage

```
temkinplot(Ce, Qe)
```

Arguments

Ce	the numerical value for the equilibrium capacity
Qe	the numerical value for the adsorbed capacity

Value

the plot for the Temkin Isotherm Analysis

Examples

```
temkinplot (c(1,2,3,4,5),c(1,2,3,4,5))
```

tothanalysis *Toth Isotherm*

Description

Another empirical modification of the Langmuir equation with the aim of reducing the error between experimental data and predicted value of equilibrium data.

Usage

```
tothanalysis(Ce, theta)
```

Arguments

Ce	the numerical value for the equilibrium capacity
theta	the numerical value representing the fractional coverage

Value

the linear regression and the parameters for the Toth isotherm analysis

tothplot *Toth Isotherm Plot*

Description

Plot of the analysis of Toth Isotherm

Usage

```
tothplot(Ce, theta)
```

Arguments

Ce	the numeric value for the equilibrium concentration
theta	the numeric value for the fractional coverage

Value

the LSRL plot for a toth isotherm analysis

Examples

```
tothplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

webervvanalysis *Weber Van Vliet Isotherm Analysis*

Description

An empirical relation with four parameters that provided excellent description of data patterns for a wide range of adsorption systems.

Usage

```
webervvanalysis(Qe, Ce)
```

Arguments

Qe	the numerical value for the adsorbed capacity
Ce	the numerical value for the equilibrium capacity

Value

the linear regression and the parameters for the Weber Van Vliet isotherm analysis

WVVplot *Weber Van Vliet Isotherm Plot*

Description

Plot of the abalysis of Weber Van Vliet Isotherm

Usage

```
WVVplot(Qe, Ce)
```

Arguments

Qe	the numeric value for the adsorbed concentration
Ce	the numeric value for the equilibrium concentration

Value

the linear plot for the Weber Van Vliet Isotherm

Examples

```
WVVplot(c(1,2,3,4,5),c(1,2,3,4,5))
```

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