Package 'RLumCarlo'

May 3, 2019

Type Package

Title Monte-Carlo Methods for Simulating Luminescence Phenomena

Version 0.1.0.9000-6

Date 2019-05-03

Author Johannes Friedrich [aut, trl, cre] (<https://orcid.org/0000-0002-0805-9547>),
Sebastian Kreutzer [aut] (<https://orcid.org/0000-0002-0734-2199>)

Maintainer Johannes Friedrich <johannes.friedrich@uni-bayreuth.de>

Description
A collection of functions to simulate luminescence signals with Monte-Carlo methods in the mineral feldspar based on published models.

Contact Package Developer Team <johannes.friedrich@uni-bayreuth.de>

License GPL-3

BugReports https://github.com/R-Lum/RLumCarlo/issues

Depends R (>= 3.3.0),
utils,
magrittr

URL https://CRAN.R-project.org/package=RLumModel

LinkingTo Rcpp,
RcppProgress,
RcppArmadillo

Imports abind,
doParallel,
foreach,
parallel,
methods,
Rcpp

Suggests R.rsp

Encoding UTF-8

VignetteBuilder R.rsp

RoxygenNote 6.1.1

R topics documented:

`RLumCarlo-package` *Modelling luminescence signals in feldspar*

Description

Details

Package:	RLumCarlo
Type:	Package
Version:	0.0.2
Date:	2018-08-28
License:	GPL-3

Author(s)

Johannes Friedrich (University of Bayreuth, Germany), Sebastian Kreutzer, IRAMAT-CRP2A, UMR 5060, CNRS-Université Bordeaux Montaigne (France)

`calc_RLumCarlo` *Plot results from Monte-Carlo simulations with RLumCarlo*

Description

Plot results from Monte-Carlo simulations with RLumCarlo

Usage

```
calc_RLumCarlo(results)
```

Arguments

results	array:

Value

This function returns a data.frame

Function version

0.0.1 [2017-01-27]

How to cite

Friedrich, J. (2019). calc_RLumCarlo(): Plot results from Monte-Carlo simulations with RLumCarlo. Function version 0.0.1 [2017-01-27]. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Johannes Friedrich, University of Bayreuth (Germany)

---

plot_RLumCarlo *Plot results from Monte-Carlo simulations with RLumCarlo*

Description

Plot results from Monte-Carlo simulations with RLumCarlo

Usage

```
plot_RLumCarlo(results, times = NULL, norm = FALSE, legend = FALSE,
  add = FALSE, ...)
```

Arguments

results	data.frame (**required**)
times	numeric (*optinal*): Optional vector for the x-axis
norm	logical (*with default*): Normalise curve to the highest intensity
legend	logical (*with default*): Enable/disable legend
add	logical (*with default*): allow overplotting of results
...	further arguments that can be passed to control the plot output. Currently supported are: xlab, xlim, ylim, main, lwd, type

Value

This function returns a graphical output

Function version

0.1.0

How to cite

Friedrich, J., Kreutzer, S. (2019). plot_RLumCarlo(): Plot results from Monte-Carlo simulations with RLumCarlo. Function version 0.1.0. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Johannes Friedrich, University of Bayreuth (Germany), Sebastian Kreutzer, IRAMAT-CRP2A, Université Bordeaux Montaigne (France)

---

run_MC_CW_IRSL *Run Monte-Carlo simulation for CW-IRSL*

Description

Run Monte-Carlo simulation for CW-IRSL

Usage

```
run_MC_CW_IRSL(A, rho, times, clusters = 10, r = NULL, N_e = 200,
  method = "seq", output = "signal", ...)
```

Arguments

A	numeric
rho	numeric
times	vector (with default)
clusters	numeric (with default):
r	numeric (with default)
N_e	numeric (with default):
method	character (with default):
output	character (with default):
...	further arguments

Value

This function returns a list.

Function version

0.0.2 [2017-01-31]

How to cite

Friedrich, J., Kreutzer, S. (2019). run_MC_CW_IRSL(): Run Monte-Carlo simulation for CW-IRSL. Function version 0.0.2 [2017-01-31]. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Johannes Friedrich, University of Bayreuth (Germany), Sebastian Kreutzer, IRAMAT-CRP2A, Université Bordeaux Montaigne (France)

References

Pagonis 2017

Examples

```
## Not run:

##============================================================================##
## Example 1: Simulate CW-IRSL measurement
##============================================================================##

run_MC_CW_IRSL(A = 0.12, rho = 0.003, times = 0:1000) %>%
  calc_RLumCarlo() %>%
    plot_RLumCarlo(norm = T, legend = T)

## End(Not run)
```

---

run_MC_CW_IRSL_DELOC *Run Monte-Carlo simulation for CW-IRSL for GOT model*

Description

##TODO

Usage

```
run_MC_CW_IRSL_DELOC(A, times, clusters = 10, N_e = 200,
  n_filled = N_e, R, method = "par", output = "signal", ...)
```

Arguments

A	numeric (*required*)
times	numeric (with default)
clusters	numeric (with default):
N_e	integer (with default)
n_filled	integer (with default)
R	numeric (with default):
method	character (with default):
output	character (with default):
...	further arguments

Details

$$I_{DELOC}(t) = -dn/dt = p(t) * (n^2/(NR + n(1 - R)))$$

Value

This function returns an array with dimension length(times) x length(r) x clusters

Function version

0.0.1

How to cite

Kreutzer, S. (2019). run_MC_CW_IRSL_DELOC(): Run Monte-Carlo simulation for CW-IRSL for GOT model. Function version 0.0.1. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Sebastian Kreutzer, IRAMAT-CRP2A, UMR 5060, CNRS - Université Bordeaux Montaigne (France)

References

##TODO

Examples

```
##============================================================================##
## Example 1: Simulate CW-IRSL
##============================================================================##
## Not run:
run_MC_CW_IRSL_DELOC(
 A = 0.12,
 R = 1,
 times = 0:100) %>%
   calc_RLumCarlo() %>%
   plot_RLumCarlo(legend = T)


## End(Not run)
```

---

run_MC_CW_IRSL_LOC *Run Monte-Carlo simulation for CW-IRSL for localised transition*

Description

##TODO

Usage

```
run_MC_CW_IRSL_LOC(A, times, clusters = 10, n_filled = 100, r,
  method = "par", output = "signal", ...)
```

Arguments

A	numeric (**required**)
times	numeric (*with default*):
clusters	numeric (*with default*):
n_filled	integer (*with default*):
r	numeric (*with default*):
method	character (*with default*):
output	character (*with default*):
...	further arguments

Details

$$I_{LOC}(t) = -dn/dt = A * (n^2/(r+n))$$

Value

This function returns an array with dimension length(times) x length(r) x clusters

Function version

0.0.1

How to cite

Kreutzer, S. (2019). run_MC_CW_IRSL_LOC(): Run Monte-Carlo simulation for CW-IRSL for localised transition. Function version 0.0.1. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Sebastian Kreutzer, IRAMAT-CRP2A, UMR 5060, CNRS - Université Bordeaux Montaigne (France)

References

##TODO

Examples

```
##============================================================================##
## Example 1: Simulate CW-IRSL
##============================================================================##
## Not run:
run_MC_CW_IRSL_LOC(
 A = 0.12,
 r = 1,
```

```
 times = 0:100) %>%
   calc_RLumCarlo() %>%
   plot_RLumCarlo(legend = T)


## End(Not run)
```

`run_MC_ISO` *Run Monte-Carlo simulation for isothermal measurements*

Description

Run Monte-Carlo simulation for isothermal measurements

Usage

```
run_MC_ISO(E, s, T = 200, rho, times, clusters = 10, r = NULL,
  N_e = 200, method = "par", output = "signal", ...)
```

Arguments

`E`	numeric (**required**)
`s`	numeric (**required**)
`T`	numeric (**required**)
`rho`	numeric (**required**)
`times`	numeric (*with default*)
`clusters`	numeric (*with default*):
`r`	numeric (*with default*)
`N_e`	numeric (*with default*)
`method`	character (*with default*)
`output`	character (*with default*)
`...`	further arguments

Value

This function returns a list.

Function version

0.1.0

How to cite

Friedrich, J., Kreutzer, S. (2019). run_MC_ISO(): Run Monte-Carlo simulation for isothermal measurements. Function version 0.1.0. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Johannes Friedrich, University of Bayreuth (Germany), Sebastian Kreutzer, IRAMAT-CRP2A, UMR 5060, CNRS - Univerité Bordeaux Montaigne (France)

References

Pagonis 2017

Examples

```
## Not run:
##============================================================================##
## Example 1: Simulate isothermal measurement
##============================================================================##

times <- seq(0, 5000)
run_MC_ISO(
 E = 1.2,
 s = 1e10,
 T = 200,
 rho = 0.007,
 times = times) %>%
  calc_RLumCarlo() %>%
  plot_RLumCarlo(legend = T)

## End(Not run)
```

---

run_MC_ISO_DELOC *Run Monte-Carlo simulation for ISO for GOT model*

Description

##TODO

Usage

```
run_MC_ISO_DELOC(s, E, T = 20, times, clusters = 10, N_e = 200,
  n_filled = N_e, R, method = "par", output = "signal", ...)
```

Arguments

s	numeric (*required*)
E	numeric (*required*)
T	numeric (*with default*)
times	numeric (with default)
clusters	numeric (with default):
N_e	integer (with default)
n_filled	integer (with default)
R	numeric (with default):
method	character (with default):
output	character (with default):
...	further arguments

Details

$$I_{DELOC}(t) = -dn/dt = p(t) * (n^2/(NR + n(1 - R)))$$

Value

This function returns an array with dimension length(times) x length(r) x clusters

Function version

0.0.1

How to cite

Kreutzer, S. (2019). run_MC_ISO_DELOC(): Run Monte-Carlo simulation for ISO for GOT model. Function version 0.0.1. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Sebastian Kreutzer, IRAMAT-CRP2A, UMR 5060, CNRS - Université Bordeaux Montaigne (France)

References

##TODO

Examples

```
##============================================================================##
## Example 1: Simulate ITL
##============================================================================##
## Not run:
run_MC_ISO_DELOC(
 s = 3.5e12,
 E = 1.45,
 T = 200,
 R = 1,
 times = 0:10000) %>%
   calc_RLumCarlo() %>%
   plot_RLumCarlo(legend = T)


## End(Not run)
```

`run_MC_ISO_LOC` *Run Monte-Carlo simulation for ITL for localised transition*

Description

##TODO

Usage

```
run_MC_ISO_LOC(s, E, T = 20, times, clusters = 10, n_filled = 100, r,
  method = "par", output = "signal", ...)
```

Arguments

`s`	numeric (**required**)
`E`	numeric (**required**)
`T`	numeric (*with default*)
`times`	numeric (*with default*):
`clusters`	numeric (*with default*):
`n_filled`	integer (*with default*):
`r`	numeric (*with default*):
`method`	character (*with default*):
`output`	character (*with default*):
`...`	further arguments

Details

$$I_{LOC}(t) = -dn/dt = p(t) * (n^2/(r+n))$$

Value

This function returns an array with dimension length(times) x length(r) x clusters

Function version

0.0.1

How to cite

Kreutzer, S. (2019). run_MC_ISO_LOC(): Run Monte-Carlo simulation for ITL for localised transition. Function version 0.0.1. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Sebastian Kreutzer, IRAMAT-CRP2A, UMR 5060, CNRS - Université Bordeaux Montaigne (France)

References

##TODO

Examples

```
##============================================================================##
## Example 1: Simulate ITL
##============================================================================##
## Not run:
run_MC_ISO_LOC(
 s = 3.5e12,
 E = 1.45,
 T = 200,
 r = 1,
 times = 0:10000) %>%
   calc_RLumCarlo() %>%
   plot_RLumCarlo(legend = T)


## End(Not run)
```

`run_MC_LM_OSL` *Run Monte-Carlo simulation for LM-OSL*

Description

Run Monte-Carlo simulation for LM-OSL

Usage

```
run_MC_LM_OSL(A, rho, times, clusters = 10, r = NULL, delta.r = 0.1,
  N_e = 200, method = "par", output = "signal", ...)
```

Arguments

`A`	`numeric`
`rho`	`numeric`
`times`	`vector` (with default)
`clusters`	`numeric` (with default):
`r`	`numeric` (with default):
`delta.r`	`numeric` (with default):
`N_e`	`numeric` (with default):
`method`	`character` (with default):
`output`	`character` (with default):
`...`	further arguments

Value

This function returns a list.

Function version

0.0.1 [2017-01-27]

How to cite

Friedrich, J. (2019). run_MC_LM_OSL(): Run Monte-Carlo simulation for LM-OSL. Function version 0.0.1 [2017-01-27]. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Johannes Friedrich, University of Bayreuth (Germany)

References

Pagonis 2017

Examples

```
## Not run:

##TODO: Primary example, should be verified
run_MC_LM_OSL(A = 10000, rho = 0.0001, times = 1:100, clusters = 10, r = NULL,
 delta.r = 0.1,
 N_e = 200, method = "par", output = "signal") %>%
 calc_RLumCarlo() %>%
 plot_RLumCarlo(norm = T)


## End(Not run)
```

---

run_MC_LM_OSL_DELOC *Run Monte-Carlo simulation for LM-OSL for GOT model*

Description

##TODO

Usage

```
run_MC_LM_OSL_DELOC(A, times, clusters = 10, N_e = 200,
  n_filled = N_e, R, method = "par", output = "signal", ...)
```

Arguments

A	numeric (*required*)
times	numeric (with default)
clusters	numeric (with default):
N_e	integer (with default)
n_filled	integer (with default)
R	numeric (with default):
method	character (with default):
output	character (with default):
...	further arguments

Details

$$I_{DELOC}(t) = -dn/dt = p(t) * (n^2/(NR + n(1 - R)))$$

Value

This function returns an array with dimension length(times) x length(r) x clusters

Function version

0.0.1

How to cite

Kreutzer, S. (2019). run_MC_LM_OSL_DELOC(): Run Monte-Carlo simulation for LM-OSL for GOT model. Function version 0.0.1. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Sebastian Kreutzer, IRAMAT-CRP2A, UMR 5060, CNRS - Université Bordeaux Montaigne (France)

References

##TODO

Examples

```
##============================================================================##
## Example 1: Simulate LM-OSL
##============================================================================##
## Not run:
run_MC_LM_OSL_DELOC(
 A = 0.12,
 R = 1,
 times = 0:100) %>%
   calc_RLumCarlo() %>%
   plot_RLumCarlo(legend = T)
```

```
## End(Not run)
```

`run_MC_LM_OSL_LOC` *Run Monte-Carlo simulation for LM-OSL for localised transition*

Description

##TODO

Usage

```
run_MC_LM_OSL_LOC(A, times, clusters = 10, n_filled = 100, r,
  method = "par", output = "signal", ...)
```

Arguments

`A`	numeric (**required**)
`times`	numeric (*with default*):
`clusters`	numeric (*with default*):
`n_filled`	integer (*with default*):
`r`	numeric (*with default*):
`method`	character (*with default*):
`output`	character (*with default*):
`...`	further arguments

Details

$$I_{LOC}(t) = -dn/dt = A * (n^2/(r+n))$$

Value

This function returns an array with dimension length(times) x length(r) x clusters

Function version

0.0.1

How to cite

Kreutzer, S. (2019). run_MC_LM_OSL_LOC(): Run Monte-Carlo simulation for LM-OSL for localised transition. Function version 0.0.1. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Sebastian Kreutzer, IRAMAT-CRP2A, UMR 5060, CNRS - Université Bordeaux Montaigne (France)

References

##TODO

Examples

```
##============================================================================##
## Example 1: Simulate LM-OSL
##============================================================================##
## Not run:
run_MC_LM_OSL_LOC(
 A = 0.12,
 r = 1,
 times = 0:100) %>%
   calc_RLumCarlo() %>%
   plot_RLumCarlo(legend = T)


## End(Not run)
```

---

run_MC_TL *Run Monte-Carlo simulation for TL*

Description

Run Monte-Carlo simulation for TL

Usage

```
run_MC_TL(s, E, rho, r_c, times, clusters = 10, N_e = 200,
  delta.r = 0.1, method = "par", output = "signal", ...)
```

Arguments

s	list
E	numeric
rho	numeric
r_c	numeric (with default)
times	vector (with default)
clusters	numeric (with default):
N_e	numeric (with default):
delta.r	numeric (with default):
method	character (with default):
output	character (with default):
...	further arguments

Value

This function returns an array with dimension length(times) x length(r) x clusters

Function version

0.0.1 [2017-01-27]

How to cite

Friedrich, J. (2019). run_MC_TL(): Run Monte-Carlo simulation for TL. Function version 0.0.1 [2017-01-27]. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Johannes Friedrich, University of Bayreuth (Germany)

References

Pagonis 2017

Examples

```
## Not run:
##============================================================================##
## Example 1: Simulate TL measurement
##============================================================================##

times <- seq(200, 500) # time = temperature

run_MC_TL(s = 3.5e12,
          E = 1.45,
          rho = 0.015,
          r_c = 0.85,
          times = times) %>%
  calc_RLumCarlo() %>%
    plot_RLumCarlo(legend = T)

## End(Not run)
```

---

run_MC_TL_DELOC *Run Monte-Carlo simulation for TL for GOT model*

Description

##TODO

Usage

```
run_MC_TL_DELOC(s, E, times, clusters = 10, N_e = 200,
  n_filled = N_e, R, method = "par", output = "signal", ...)
```

Arguments

s	numeric (*required*)
E	numeric (*required*)
times	numeric (with default)
clusters	numeric (with default):
N_e	integer (with default)
n_filled	integer (with default)
R	numeric (with default):
method	character (with default):
output	character (with default):
...	further arguments

Details

$$I_{DELOC}(t) = -dn/dt = p(t) * (n^2/(NR + n(1 - R)))$$

Value

This function returns an array with dimension length(times) x length(r) x clusters

Function version

0.0.1

How to cite

Kreutzer, S. (2019). run_MC_TL_DELOC(): Run Monte-Carlo simulation for TL for GOT model. Function version 0.0.1. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Sebastian Kreutzer, IRAMAT-CRP2A, UMR 5060, CNRS - Université Bordeaux Montaigne (France)

References

##TODO

Examples

```
##============================================================================##
## Example 1: Simulate TL
##============================================================================##
## Not run:
run_MC_TL_DELOC(
 s = 3.5e12,
 E = 1.45,
 R = 1,
 times = 100:450) %>%
   calc_RLumCarlo() %>%
```

```
  plot_RLumCarlo(legend = T)

## End(Not run)
```

`run_MC_TL_LOC` *Run Monte-Carlo simulation for TL for localised transition*

Description

##TODO

Usage

```
run_MC_TL_LOC(s, E, times, clusters = 10, n_filled = 100, r,
  method = "par", output = "signal", ...)
```

Arguments

`s`	numeric (*required*)
`E`	numeric (*required*)
`times`	numeric (with default)
`clusters`	numeric (with default):
`n_filled`	integer (with default)
`r`	numeric (with default):
`method`	character (with default):
`output`	character (with default):
`...`	further arguments

Details

$$I_{LOC}(t) = -dn/dt = p(t) * (n^2/(r+n))$$

Value

This function returns an array with dimension length(times) x length(r) x clusters

Function version

0.0.1

How to cite

Kreutzer, S. (2019). run_MC_TL_LOC(): Run Monte-Carlo simulation for TL for localised transition. Function version 0.0.1. In: Friedrich, J., Kreutzer, S. (2019). RLumCarlo: Monte-Carlo Methods for Simulating Luminescence PhenomenaR package version 0.1.0.9000-6. https://CRAN.R-project.org/package=RLumCarlo

Author(s)

Sebastian Kreutzer, IRAMAT-CRP2A, UMR 5060, CNRS - Université Bordeaux Montaigne (France)

References

##TODO

Examples

```
##=============================================================================##
## Example 1: Simulate TL
##=============================================================================##
## Not run:
run_MC_TL_LOC(
 s = 3.5e12,
 E = 1.45,
 r = 1,
 times = 100:450) %>%
   calc_RLumCarlo() %>%
   plot_RLumCarlo(legend = T)


## End(Not run)
```

Index