Analyzing & Testing

NETZSCH
Proven Excellence.

Easy and fast:
New NEZSCH Kinetics Lite Software

Webinar

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04 / 21 / 2026

Agenda

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I. Introduction

II. Data transfer from Proteus to Kinetics

III. Basic evaluation in Kinetics Lite
   1. Activation energy
   2. Model-free kinetics
   3. Single-step kinetic analysis
   4. Select best kinetic result

IV. Predictions in Kinetics Lite: dynamic, isothermal, lifetime

V. Comparison Kinetics Lite and Kinetics Neo

VI. Advantages of Kinetics Neo

Problems to Solve by Kinetic Analysis

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Beginners:

- Activation energy
  as the value for single-step kinetics
- Reaction order
  n-th order kinetics
- Order of autocatalysis
  autocatalytic reaction
- Dimension of nucleation
  isothermal crystallization
- Activation energy Ea(α)
  for processes with kinetics change
- Isothermal predictions
- Prediction for given heating rate
- Halftime predictions
- Lifetime predictions for given α (e.g. α=5%)

Experts have also additional problems

- Multi-step kinetics
  connection of steps: independent, consecutive, competing, reversible reactions
- Detailed information for each reaction step
  Kinetic parameters
  concentrations, individual peaks
- Non-Arrhenius kinetics
  Curing with vitrification, crystallization
- Influence of additional parameter
  pressure, UV intensity, mass ratio of reactants
- Predictions for any temperature program
  for conversion, concentrations, reaction rates
- Calculation of TTT diagram
- Optimization of industrial temperature profile

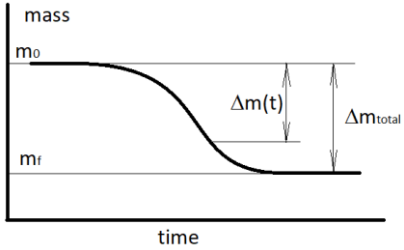
Fast and easy

For beginners only

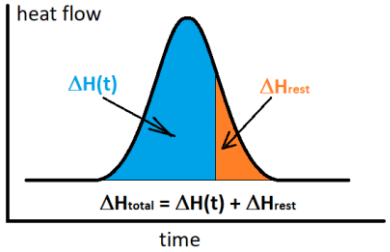
Fast and easy
Powerful and comprehensive

For beginners and experts

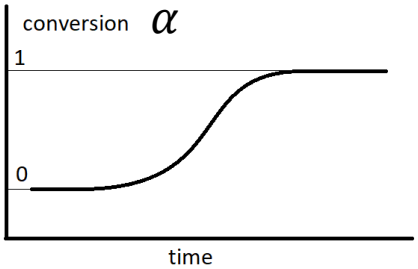
How to find activation energy?

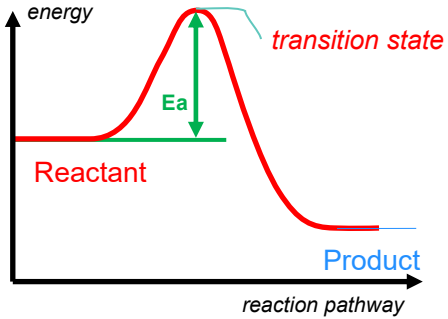


$$\alpha(t) = \frac{\Delta m(t)}{\Delta m_{total}}$$



$$\alpha(t) = \frac{\Delta H(t)}{\Delta H_{total}}$$





Arrhenius equation (1889) for reaction rate:

$$\frac{d\alpha}{dt} = A\ exp\left(\frac{-E_A}{RT}\right) f(\alpha)$$

Conversion α: degree of conversion, changing from 0 to 1

Pre-exponent A: collision frequency [1/s]

Activation energy Ea [kJ/mol]

$f(\alpha)$ Reaction type (nth order, autocatalysis, nucleation …)

R: gas constant 8.31 [J/(mol K)]

T: absolute temperature [K]: T[K]=T[°C]+273.15

Introduction. Fast and easy

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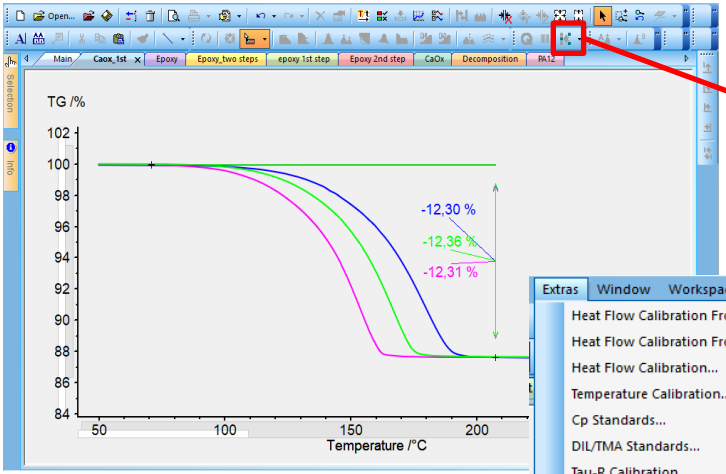
Up to now:

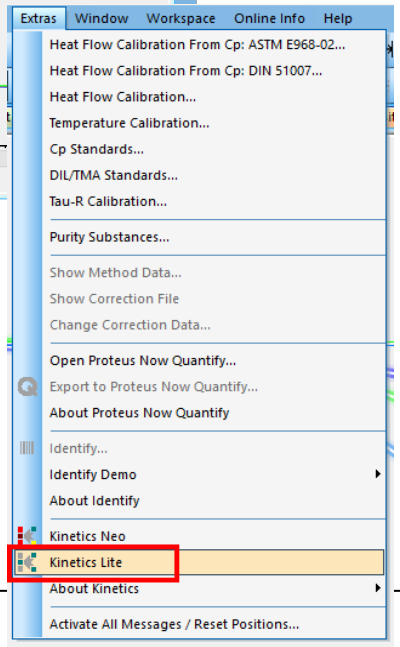
1. Measurements (Instrument)
2. Data Export
   Proteus Analysis version earlier than 9.10
   a. Range for export
   b. Acquisition rate
   c. Set File name for export
3. ***Kinetics Neo*** Version earlier than 3.8
   a. Create new project
   b. Select data type (TG, DSC, …)
   c. Select file(s) for import
   d. Select evaluation range
   e. Smoothing, Baseline
   f. Selection of method
      (model-free or model based)
   g. Selection of reaction types
   h. Results

Now:

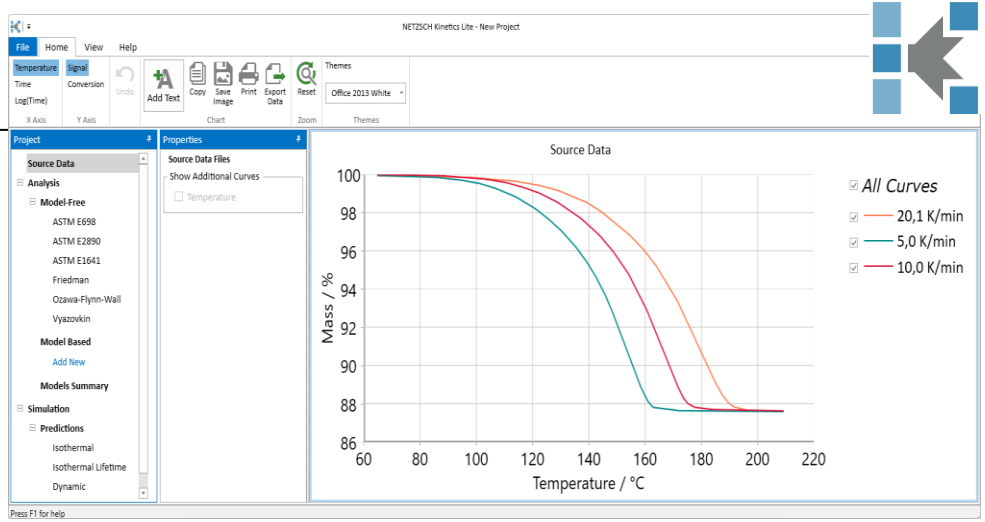
1. Measurements (instrument)
2. Proteus Analysis version from 9.10
   a. Baseline (Proteus Analysis)
   b. Click on Kinetics menu item
3. ***Kinetics Neo*** Version from 3.8
   Or ***Kinetics Lite***
   a. Selection of method
      (model-free or model based)
   b. Results

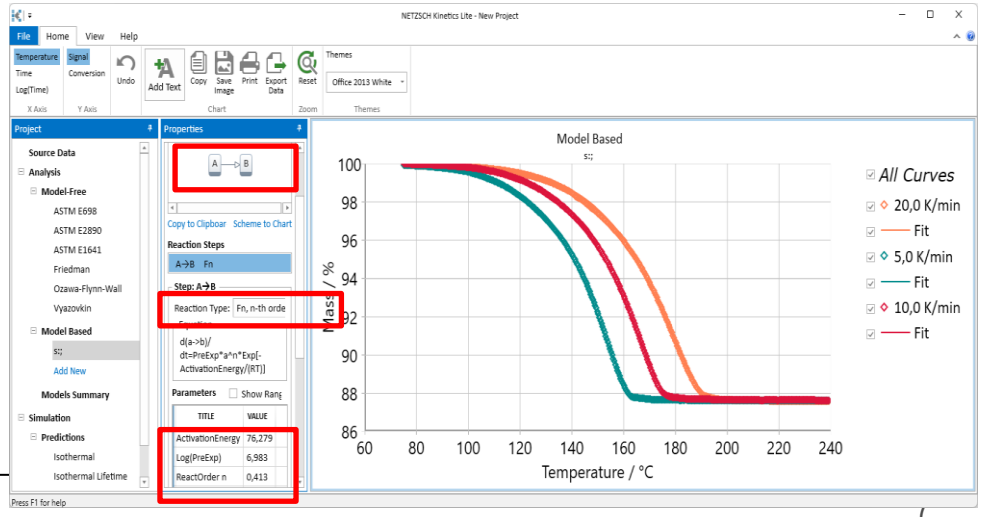
n-th order reaction:
What are activation energy and reaction order?



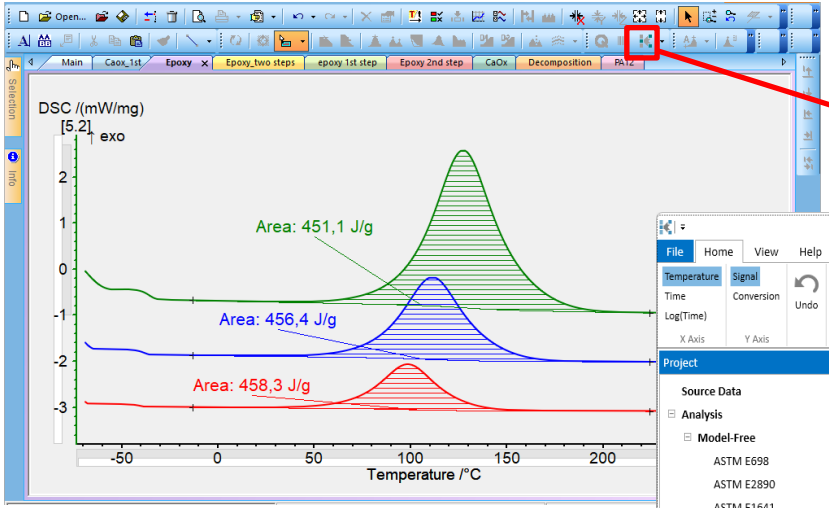


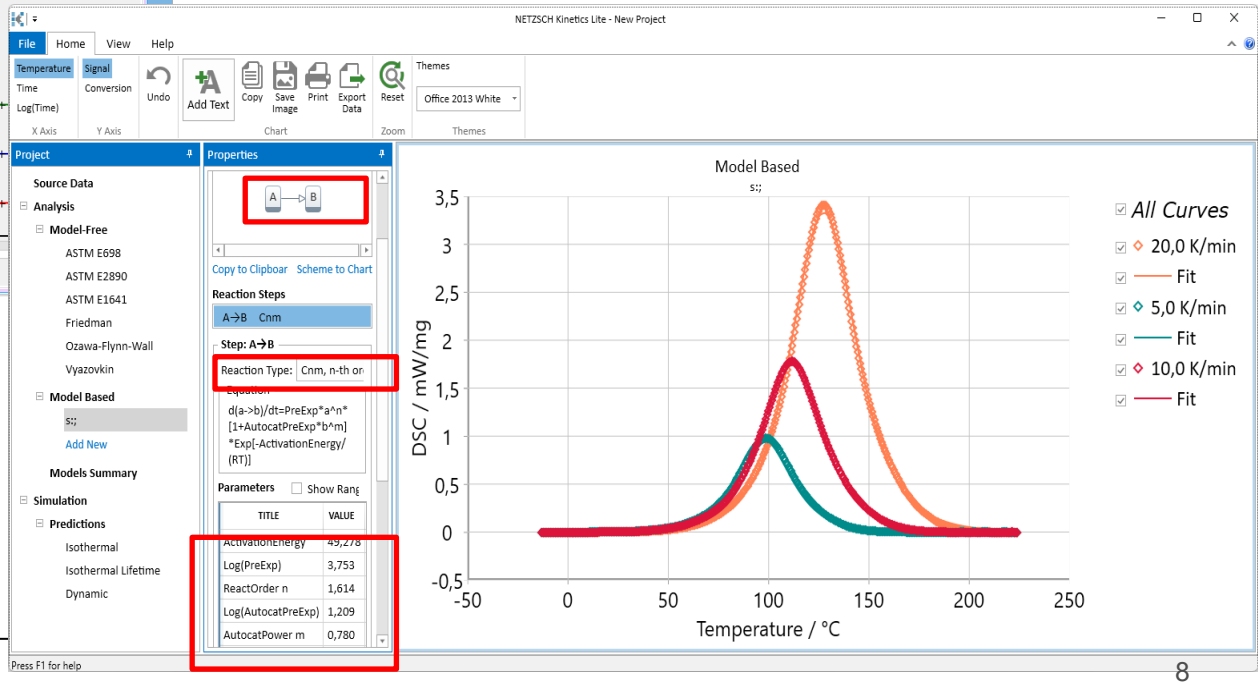
$$\frac{d\alpha}{dt} = A\,(1-\alpha)^n exp\left(\frac{-E_A}{RT}\right)$$





Autocatalytic reaction:
What are activation energy, pre-exponent and order of autocatalysis?





$$\frac{d\alpha}{dt} = A\,(1-\alpha)^n(1+K\alpha^m)exp\left(\frac{-E_A}{RT}\right)$$

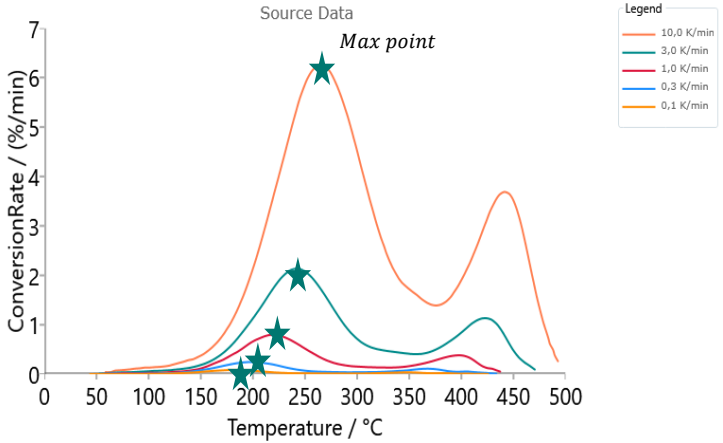
Model free methods in Kinetics Lite

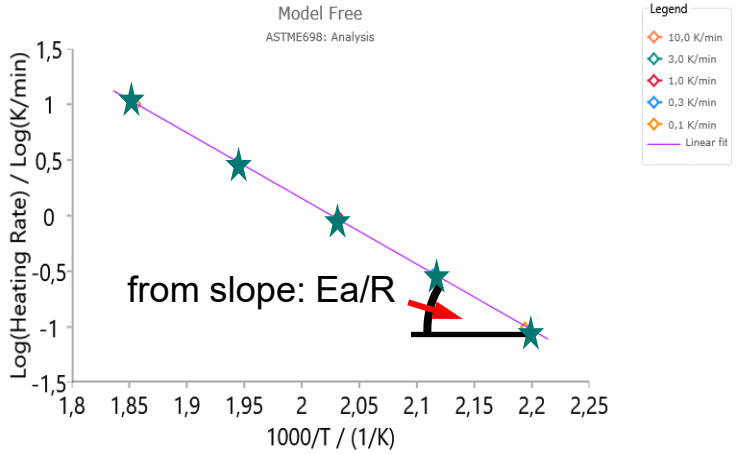
Created in last century before the modern possibilities of personal computers

One-point model free methods

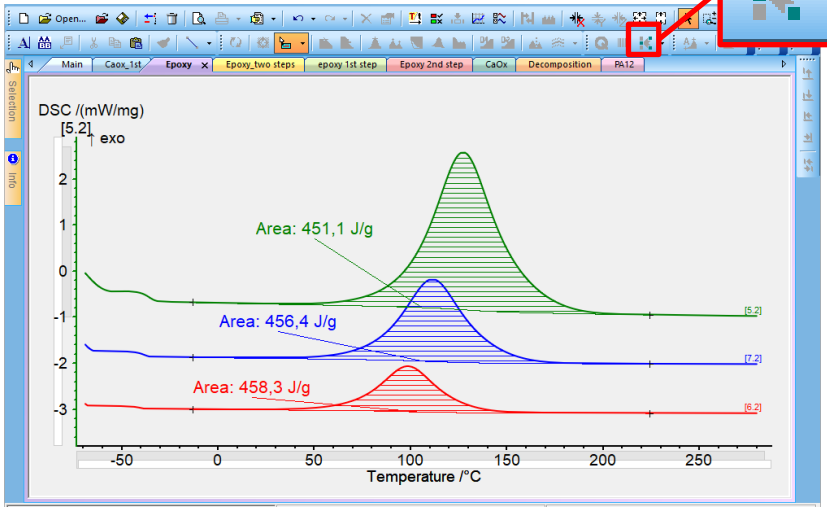
- ASTM E698
- ASTM E2890
- ASTM E1641

Result: **Value Ea**





How to find activation energy?
Single-point model-free methods



One-point model free methods

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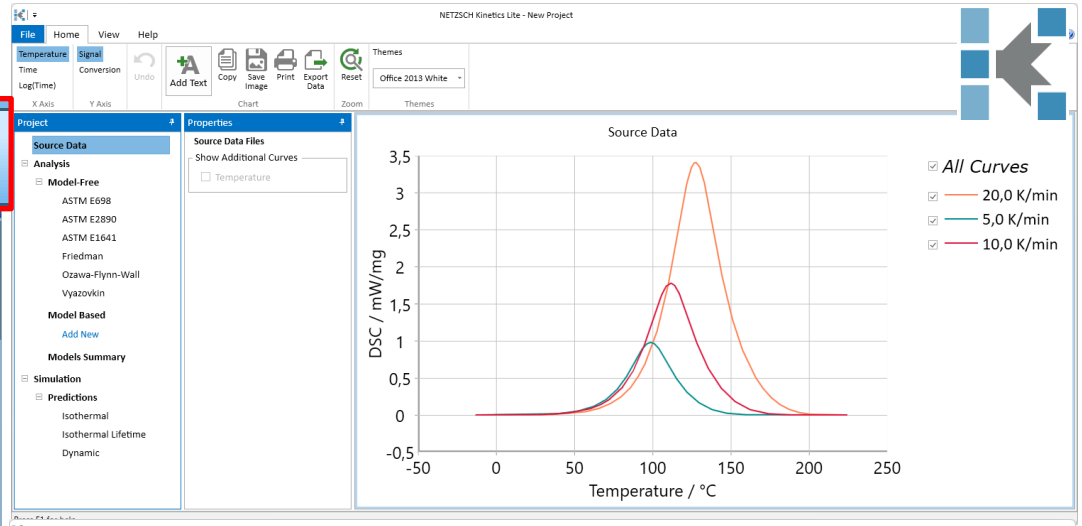
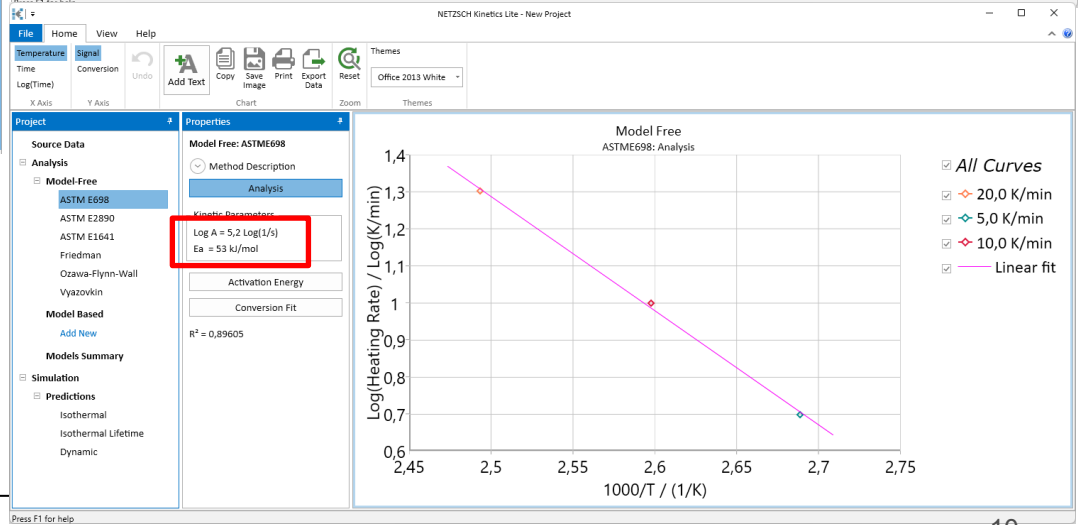
Result: **Value Ea**





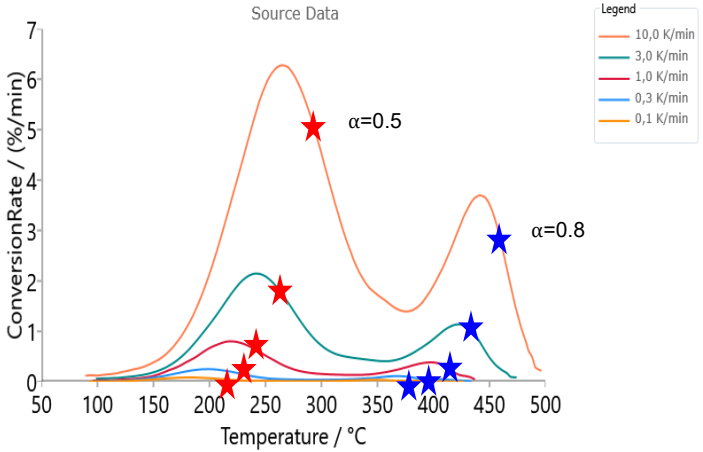
Model free methods in Kinetics Lite

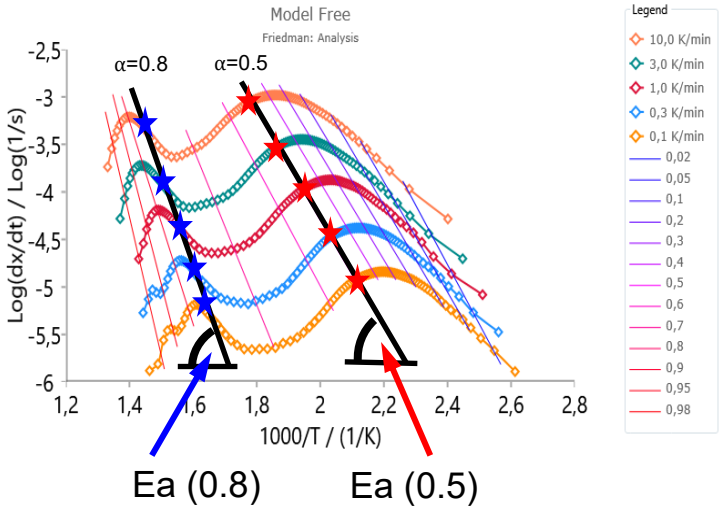
Created in last century before the modern possibilities of personal computers

Multi-points model free methods

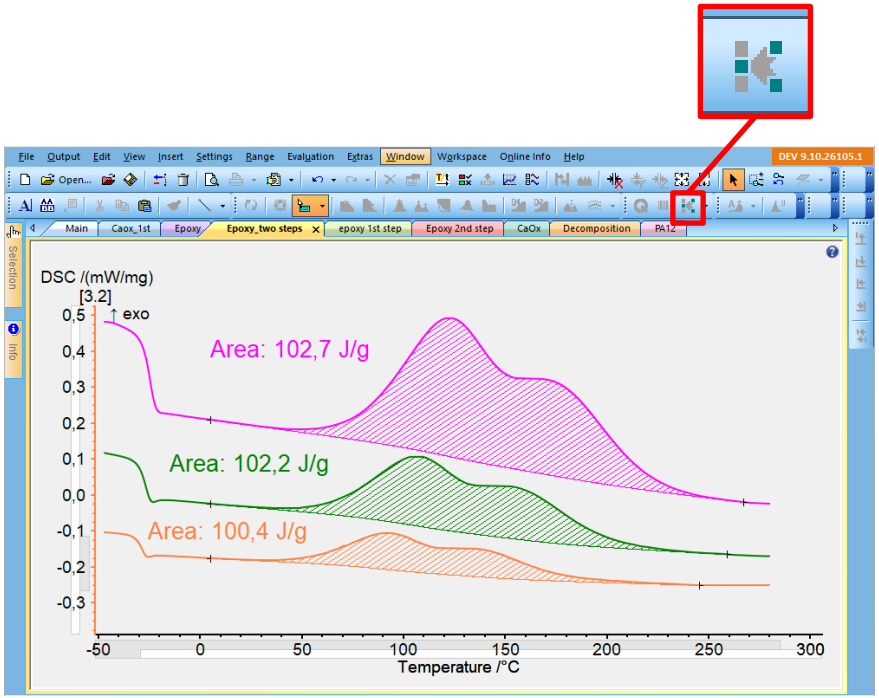
- Ozawa-Flynn-Wall (1965)
- Friedman method (1966)
- Vyazovkin for heating (1996)

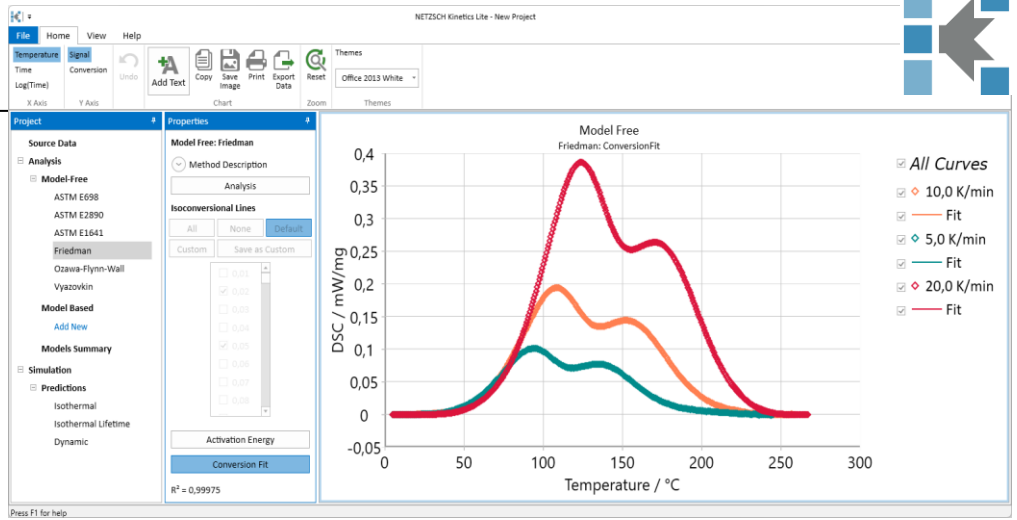
Result: **Function Ea(α)**

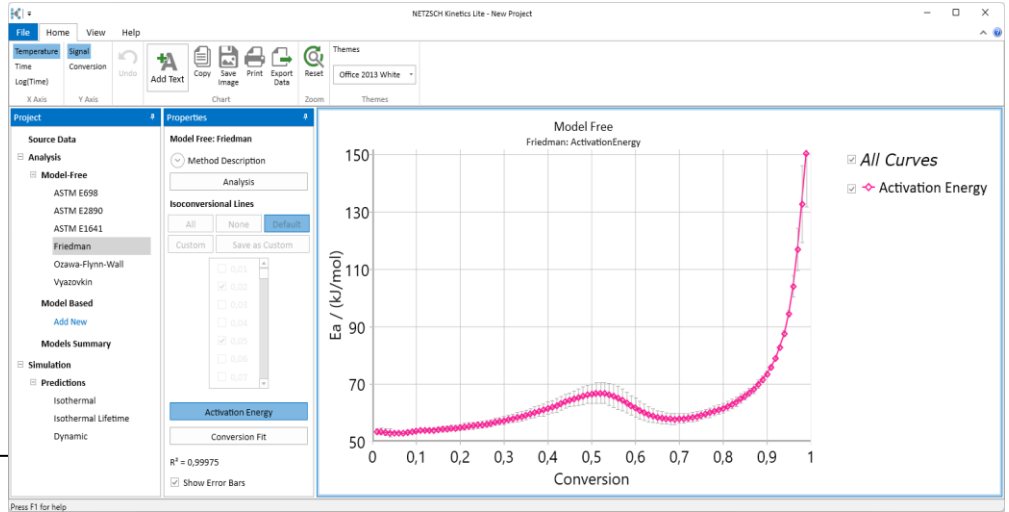




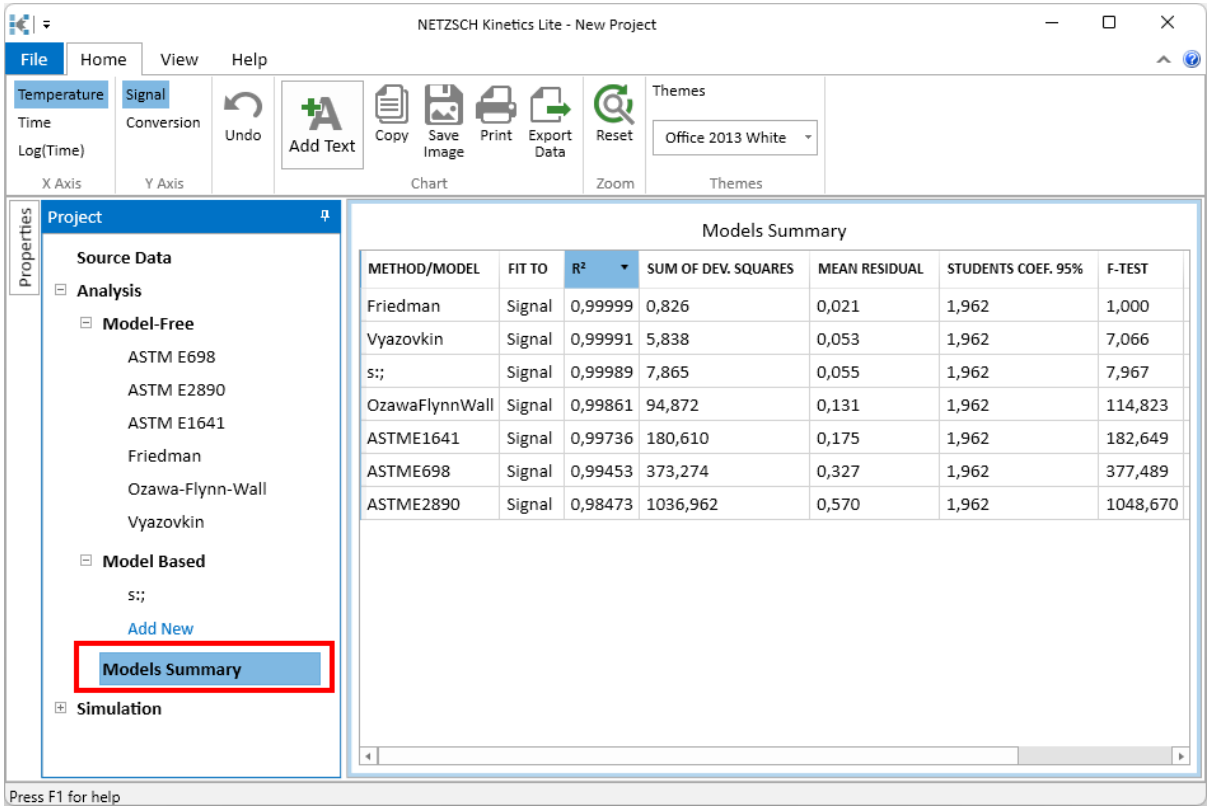
Model-free kinetics:
What is **Ea(α)** for complex process?







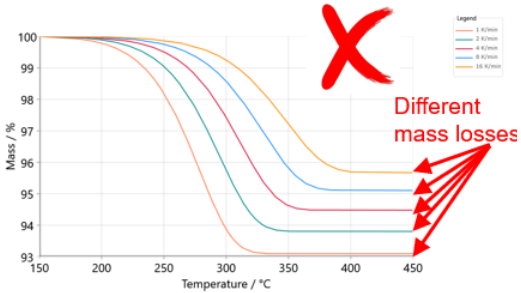
What is the best kinetic result?

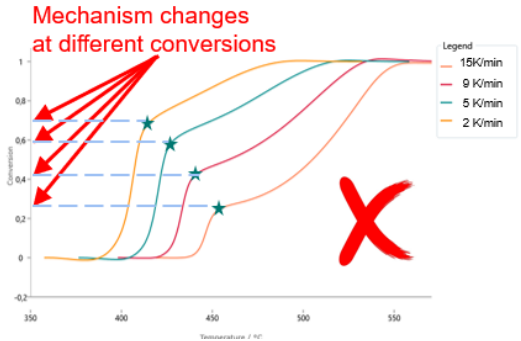


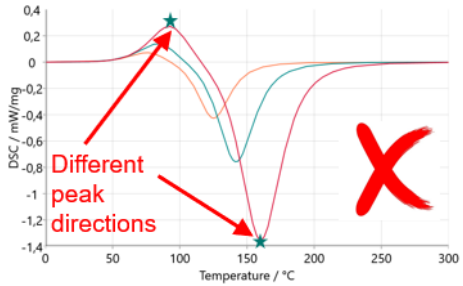
When model-free approach may not be used?
Please use only Kinetics Neo

2025-11-13 Webinar ***Kinetic Analysis: How to Choose the Most Suitable Kinetic Model in Kinetics Neo***

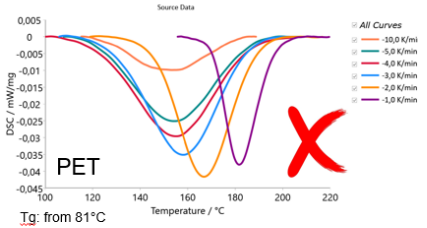
https://youtu.be/1nJXmKjDsjo?si=hFIXzsG59SVNH1Vt



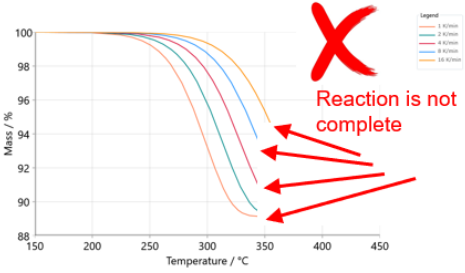




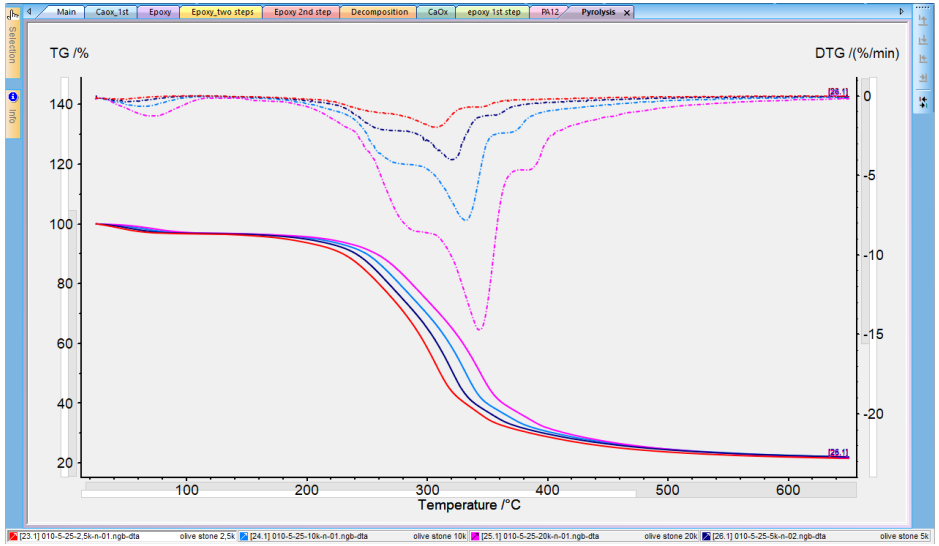
Cooling crystallization

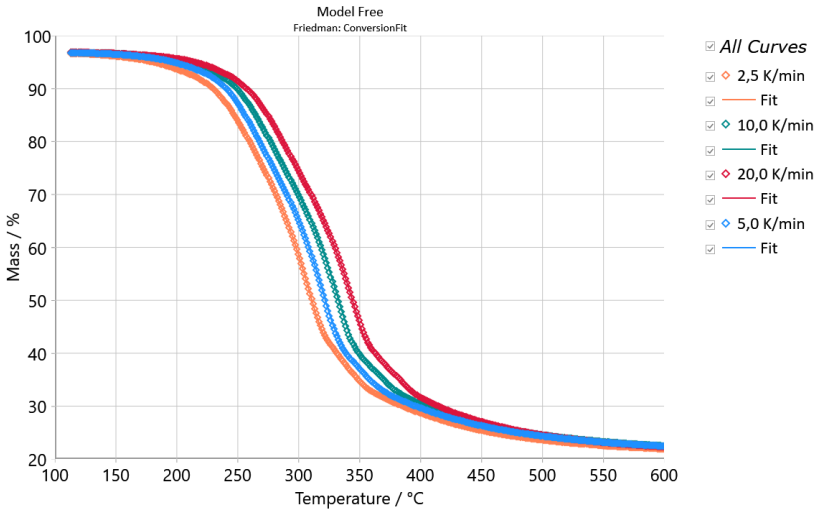


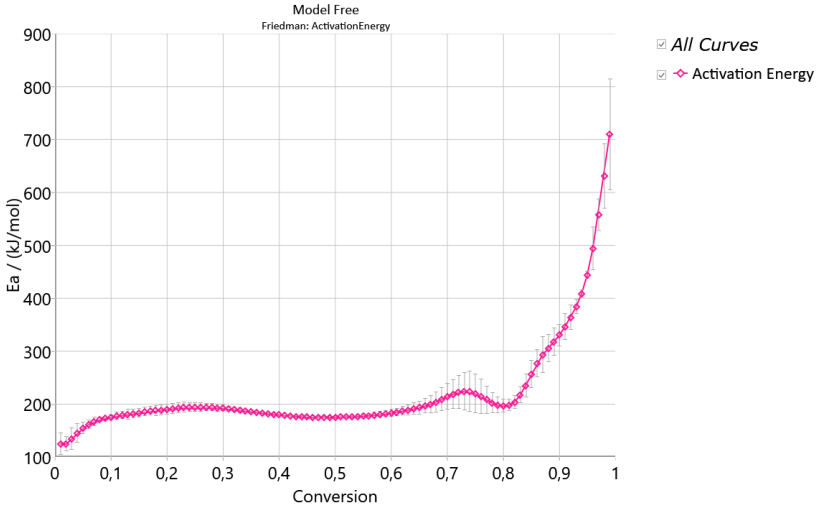
Tg: from 81°C
Tm: from 248 °C
Experiment: T from100 to 210°C
Peak area: 3.3 J/g – 38 J/g



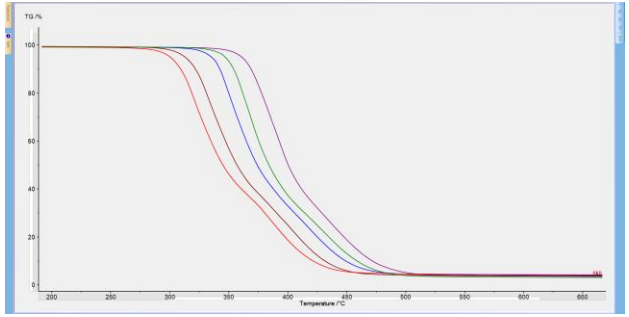
Pyrolysis

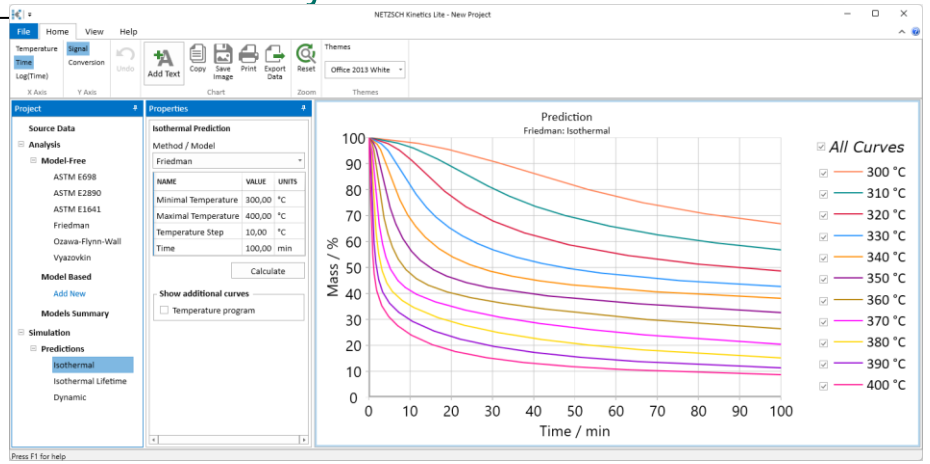

Main
Caox_1st
Epoxy
Epoxy_two steps
Epoxy 2nd step
Decomposition
CaOx
epoxy 1st step
Ph12
Pyrolysis
TG /%
DTG /(%/min)
Temperature /°C
[23.1] 010-5-25-2,5k-n-01.ngb-dta olive stone 2,5k
[24.1] 010-5-25-10k-n-01.ngb-dta olive stone 10k
[25.1] 010-5-25-20k-n-01.ngb-dta olive stone 20k
[26.1] 010-5-25-5k-n-02.ngb-dta olive stone 5k

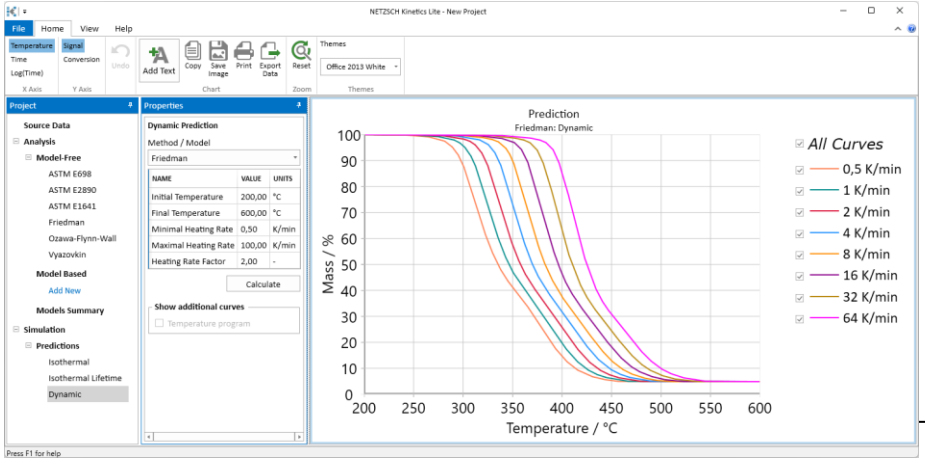

Model Free
Friedman: ConversionFit
Mass / %
Temperature / °C
All Curves
2,5 K/min
Fit
10,0 K/min
Fit
20,0 K/min
Fit
5,0 K/min
Fit

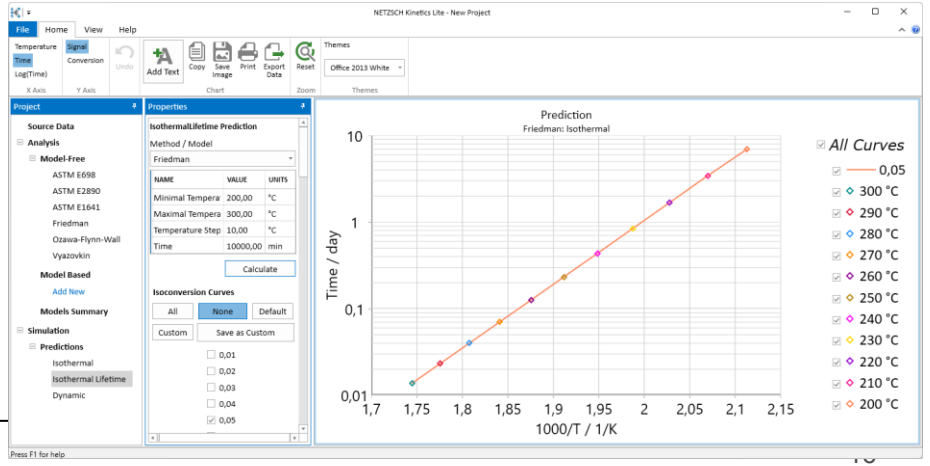

Model Free
Friedman: ActivationEnergy
Ea / (kJ/mol)
Conversion
All Curves
Activation Energy

Predictions: dynamic, isothermal, life time:
At what temperature material has 5% of conversion after 10 days?



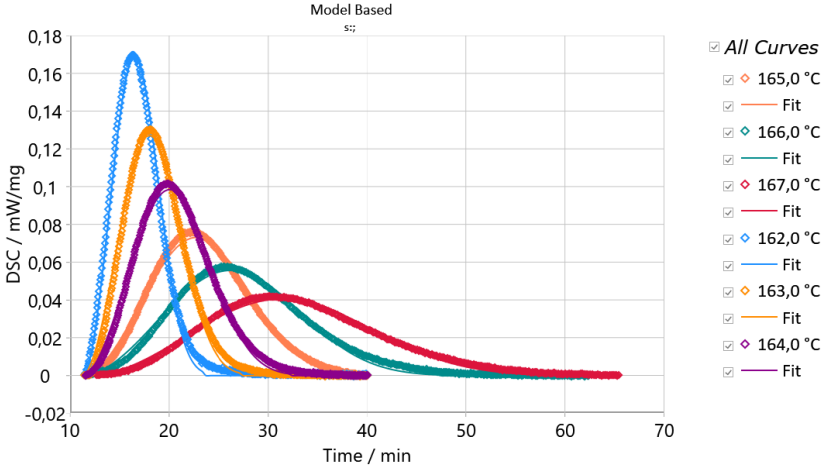




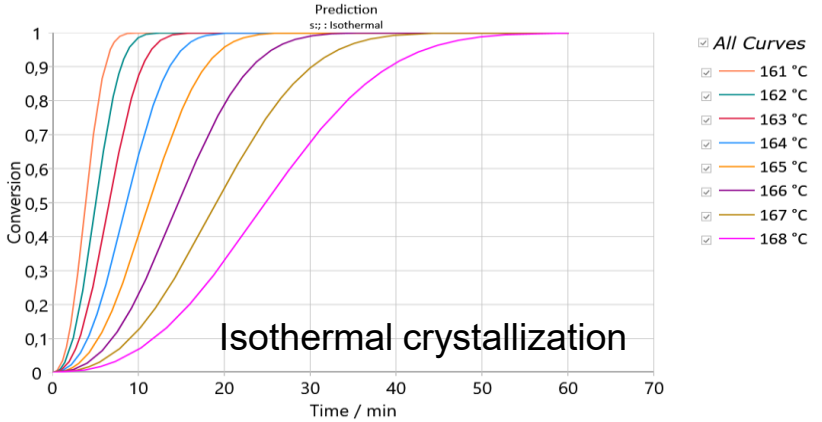


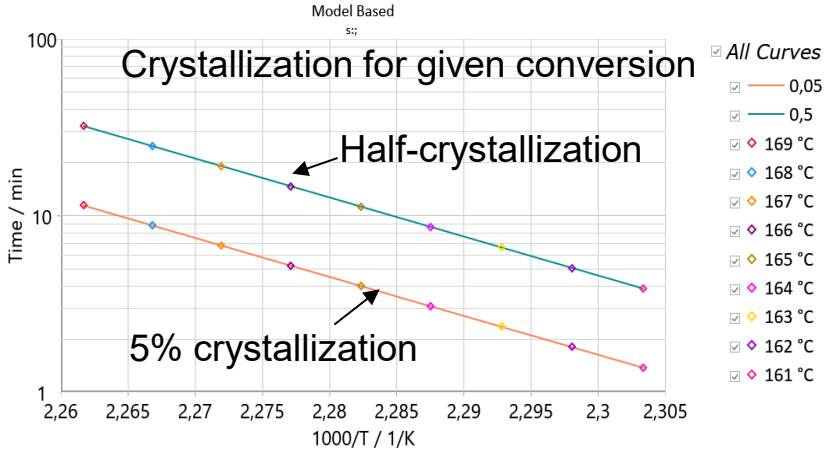
Isothermal crystallization

At what temperature polymer needs 1 hour for 50% of crystallization?



Kinetic fit for Avrami reaction type





Comparison with Kinetics Neo:

KINETICS LITE	KINETICS NEO
For beginners only	For beginners and experts
Contains basic kinetic analysis	Basic and advanced kinetic analysis
NETZSCH Proteus Analysis license: several computers in department	Per seat (computer)
Proteus support policy, consulting extra	12 months support including free consulting
NETZSCH data only	Both NETZSCH and non-NETZSCH data

Comparison with Kinetics Neo: Data types

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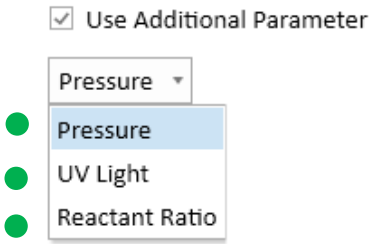
- DSC
- TG



- DSC
- TG
- DIL
- DEA
- Viscosity
- ARC Temperature (ARC, MMC)
- Arbitrary differential
  - MS,
  - Reaction rates,…
- Arbitrary integral
  - Storage modulus,
  - concentrations,
  - sparse data

● *Kinetics Neo only*

Comparison with Kinetics Neo: Model free kinetics

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- **Analysis**
  - **Model-Free**
    - ASTM E698
    - ASTM E2890
    - ASTM E1641
    - Friedman
    - Ozawa-Flynn-Wall
    - Vyazovkin

- **Analysis**
  - **Model-Free**
    - ASTM E698
    - ASTM E2890
    - ASTM E1641
    - ● Dynamic Arrhenius
    - ● Isothermal Arrhenius
    - ● ASTM E2070
    - Friedman
    - Ozawa-Flynn-Wall
    - ● Kissinger-Akahira-Sunose
    - Vyazovkin
    - ● Numerical Optimization

● *Kinetics Neo only*

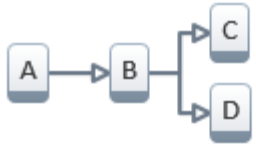
Advantages of Kinetics Neo: Model-based analysis

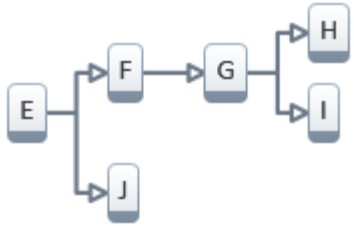
Optimize Fit To: Signal

Reaction Type:

F1, 1st order

- F1, 1st order
- F2, 2nd order
- Fn, n-th order
- C1, 1st order with autocat.
- Cn, n-th order with autocat.
- Cnm, n-th order, m-Power with autocat.
- KS, Kamal-Sourour
- A2, 2D Avrami
- A3, 3D Avrami
- An, n-Dim. Avrami





Optimize Fit To: Signal

- Signal
- Conversion
- Conversion Rate

F1, 1st order

- F1, 1st order
- F2, 2nd order
- Fn, n-th order
- FnR, Fn Reversible
- R2, 2D phase bound.
- R3, 3D phase bound.
- D1, 1D diffusion
- DFn, Diffusion with n-th order
- D2, 2D diffusion
- D3, 3D diff. Jander
- D4, 3D diff.Ginstling-Brounstein
- B1, Prout-Tompkins
- Bna, expanded Prout-Tompkins
- SB, Sestak-Berggren extended
- C1, 1st order with autocat.
- Cn, n-th order with autocat.
- Cnm, n-th order, m-Power with autocat.
- KS, Kamal-Sourour
- A2, 2D Avrami
- A3, 3D Avrami
- An, n-Dim. Avrami
- Nk, Nakamura crystallization (An + HL)
- SbC, Sbirrazzuoli crystallization (SB + HL)

● *Kinetics Neo only*

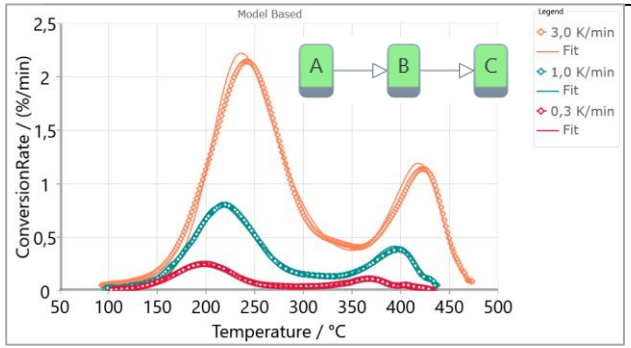
Comparison with Kinetics Neo: Predictions

- Simulation
  - Predictions
    - Isothermal
    - Isothermal Lifetime
    - Dynamic

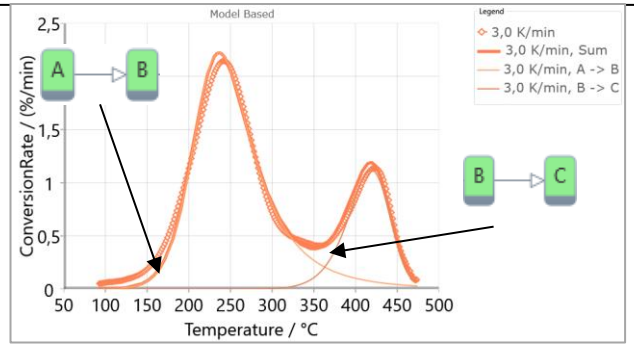
- Simulation
  - Predictions
    - Isothermal
    - Isothermal Lifetime
    - Dynamic
    - ● Multiple Step
    - ● Step Iso
    - ● Modulated Isothermal
    - ● Modulated Dynamic
    - ● Adiabatic
    - ● Adiabatic24
    - ● Climatic
    - ● Time Temperature Trans.
    - ● External Temp. Profile
  - ● Optimization
    - ● Conversion Rate
    - ● Conversion Values
    - ● Signal Rate (RCM)

● *Kinetics Neo only*

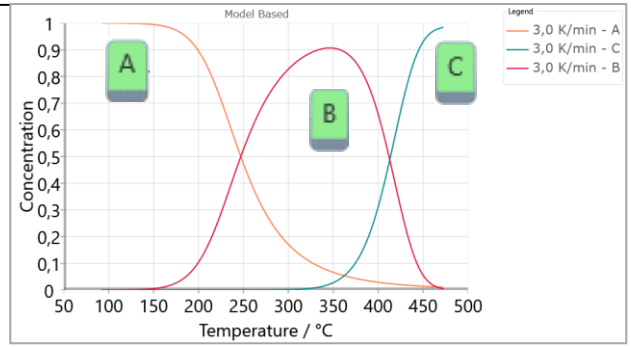
Advantages of Kinetics Neo:
Model based method with reaction steps and concentrations



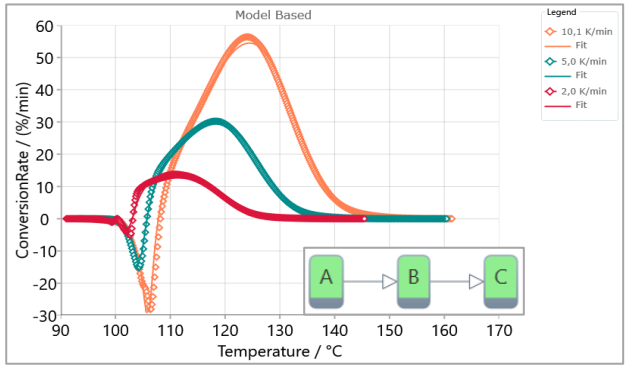
Kinetic model

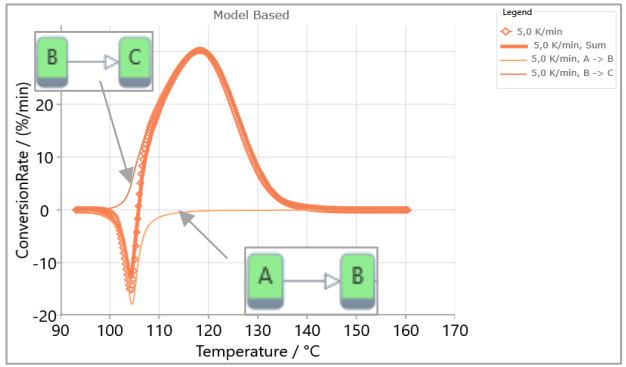


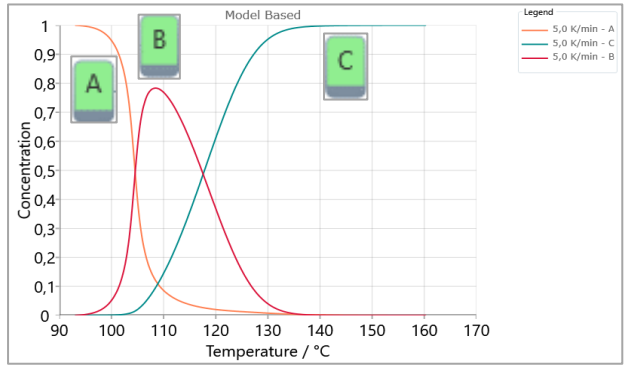
Individual reaction steps



Concentration of reactants





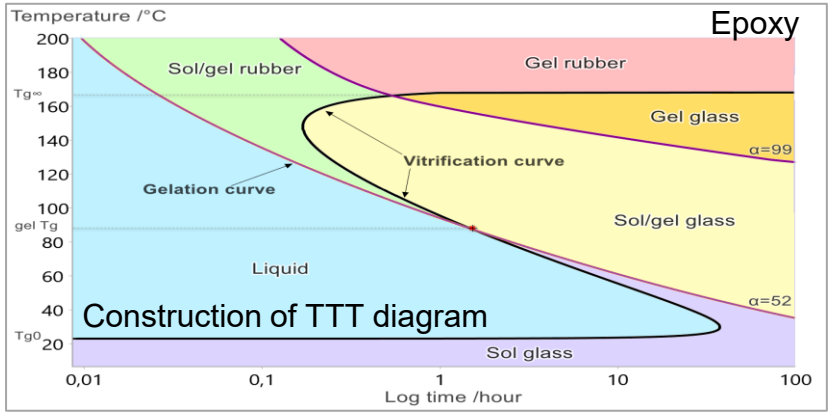


Advantages of Kinetics Neo: non-Arrhenius kineitcs

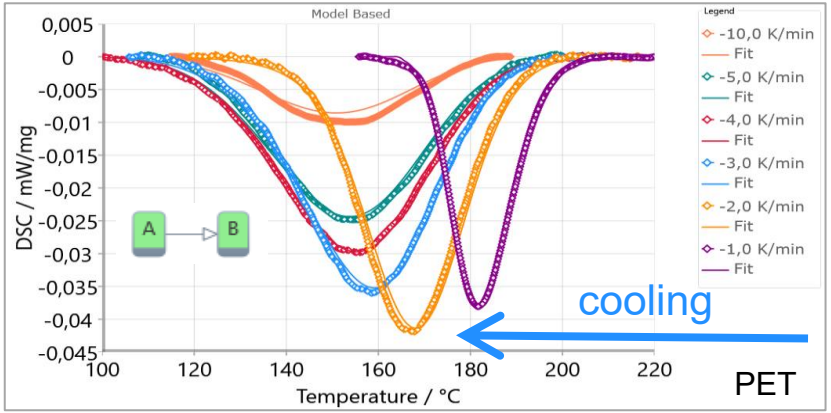
NETZSCH

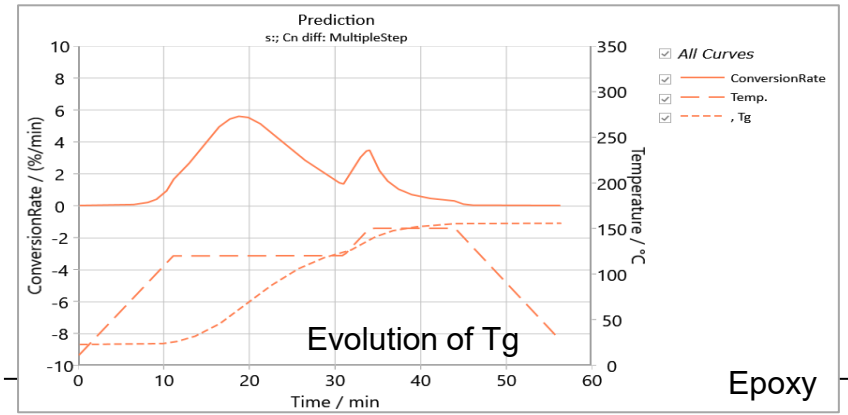
Curing with diffusion control

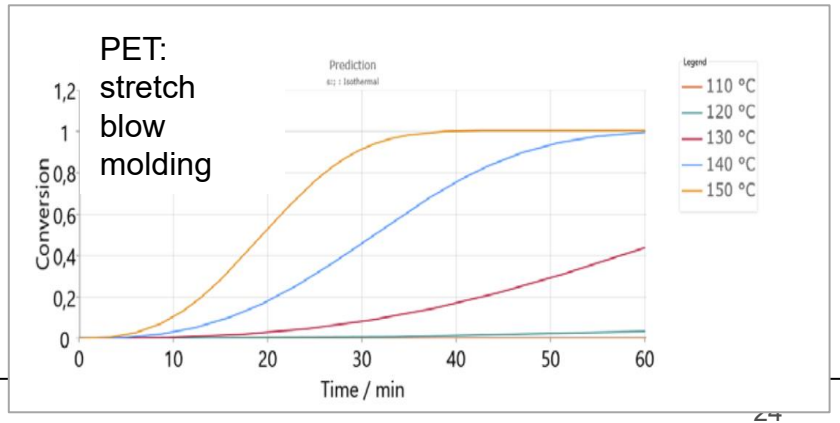
T>Tg: Elastic or viscous
T<Tg: Glass



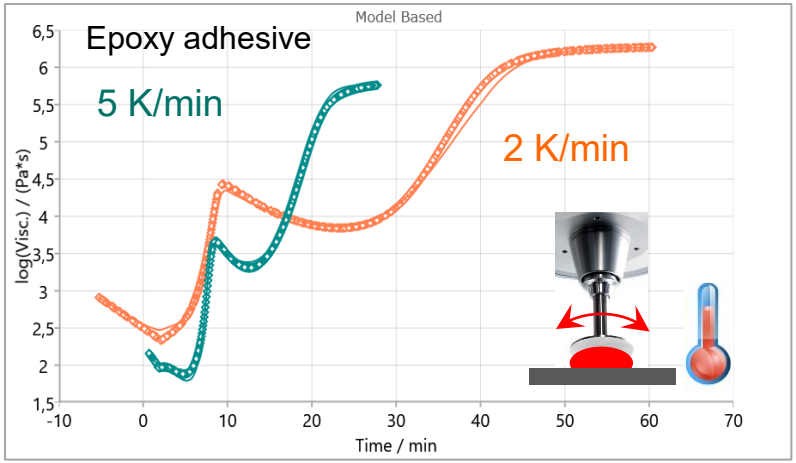
Crystallization during cooling

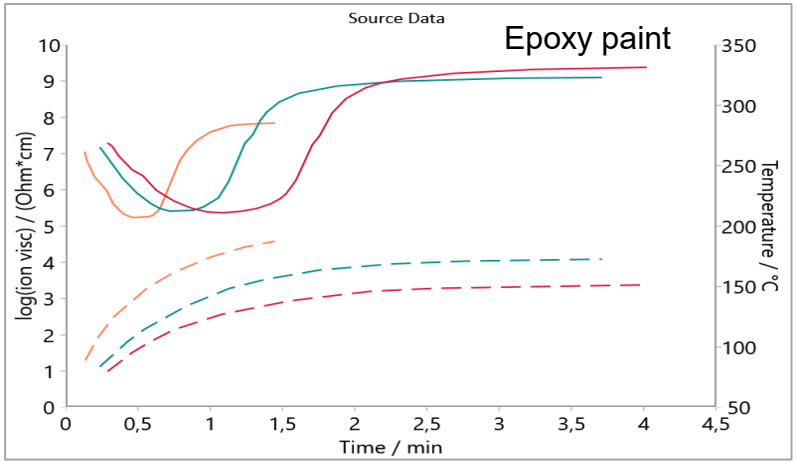


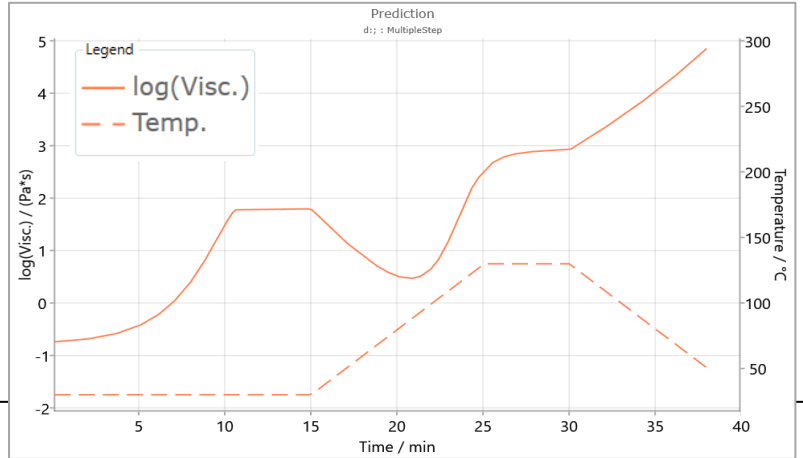


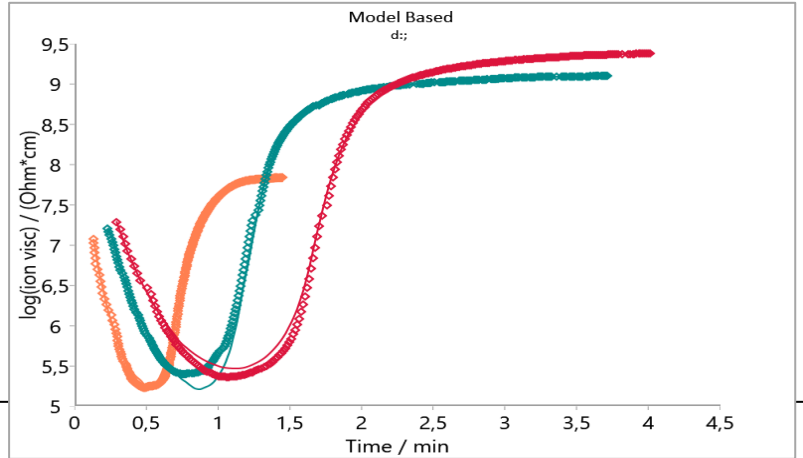


Advantages of Kinetics Neo:
Kinetics of shear viscosity(Rheology) and ion Viscosity (DEA)

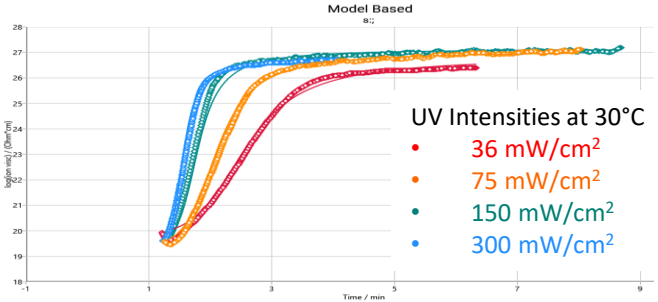




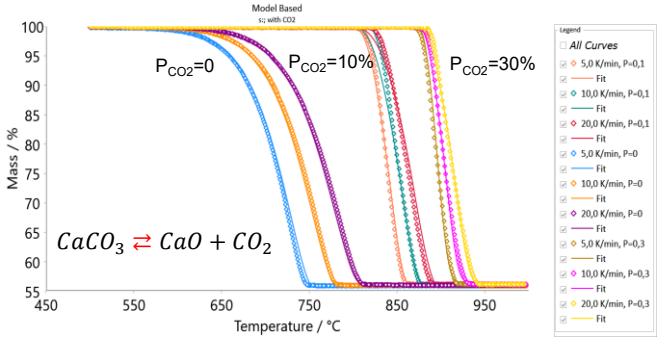




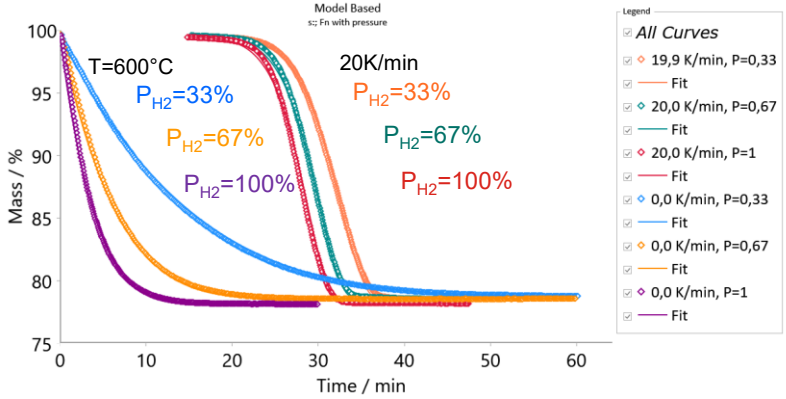
Kinetics for external parameter



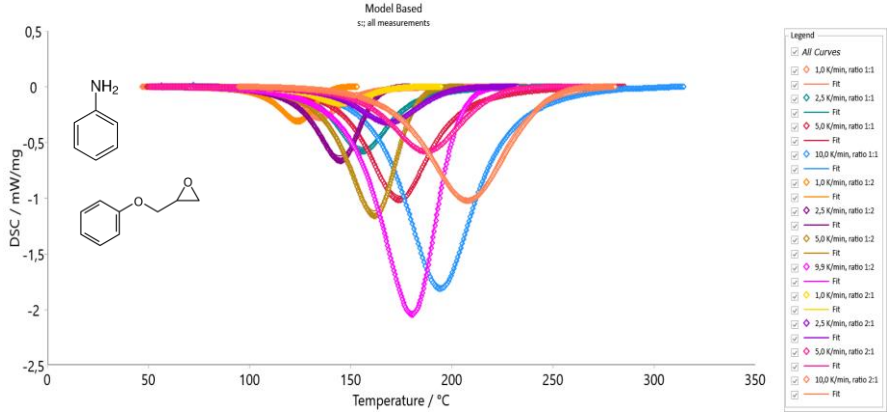
Isothermal DEA measurements at 30°C for light exposure at different intensities from 75mW/cm² to 150mW/cm²



Reversible reaction of decomposition of CaCO3 under different partial pressure of CO2



TG measurements for reduction of SnO2 at different partial pressure of H_2 , T=600°C



Curing of different mass ratios of epoxy and aniline

NETZSCH Kinetics Neo Web Site: kinetics.netzsch.com
NETZSCH Kinetics Lite Web Site: kineticsLite.netzsch.com

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https://kineticslite.netzsch.com/en

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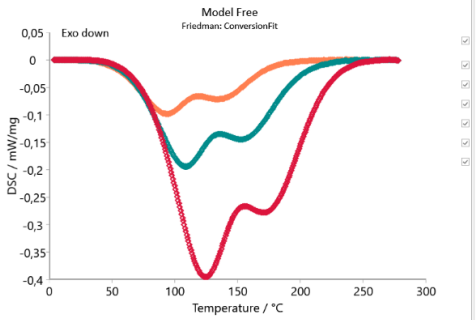
Kinetics Lite

Software for basic kinetic analysis of TGA/DSC measurements for chemical processes using both model-free and single-step model-based kinetic methods. Prediction … for isothermal or constant heating conditions.

What Is Kinetics Lite

Kinetics Lite is the basic version of software for analysis of rate of chemical reaction depending on the ter… of such reactions are decomposition, storage of thermally instable materials, chemical aging, curing above… temperature.

Data for analysis are measurements carried out on *NETZSCH* thermal analysis instruments. The software ca… data of Differential Scanning Calorimetry (DSC) or Thermogravimetry (TG) which are transferred from *Prot…* by one click. For each analysis method *Kinetics Lite* provides simulated fit and R^2 for its quality. Results of k… for isothermal predictions at user-defined temperatures or for user-defined heating rates.



https://kineticslite.netzsch.com/en/features

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Kinetics Lite Features Comparison

Kinetics Lite is the basic version of software for kinetic analysis of TG or DSC data. It contains well-known model-free analysis methods and model-based methods for *single-step* reactions of mostly used reaction types based on Arrhenius law. For each method Kinetics Lite provides simulated fit and R^2 for its quality results of kinetic analysis can be used for isothermal predictions at user-defined temperatures or for user-defined heating rates.

Kinetics Neo is the full version of software for kinetic analysis of different data types. It contains many model-free and model-based analysis methods for both single and multi-step models, as well as independent, competing or overlapping consecutive steps. Each step has own reaction type. It includes analysis for both Arrhenius and non-Arrhenius processes as well as considering glass transition temperature for cross-linking reactions with diffusion control and for crystallization kinetics during cooling.

Kinetics Neo allows for predictions of signal, conversion, reaction rates of individual reaction steps, and formal concentrations of individual reactants for different temperature programs, including not only heating or isotherm, but also multi-segment program, arbitrary temperature curve or predictions cording to climatic conditions at selected weather station on the globe.

Kinetics Neo allows to optimize temperature profile for the industrial applications either for constant process rate or for the given conversion-time dependence.

	Kinetics Lite	Kinetics Neo
Data Sources	NETZSCH Measurements	NETZSCH or non-NETZSCH measurements Data with few points (sparse data) Data for incomplete reaction
Data Types	TG, DSC	TG, DSC, DIL, DEA, ARC,MMC, Viscosity, DMA,MS, Arbitrary integral data (e.g. Concentrations), Arbitrary Differential data
Model-Free single-point methods	ASTM E698, ASTM E2890, ASTM E1641	ASTM E698, ASTM E2890, ASTM E1641 Isothermal Arrhenius (OIT)

https://kinetics.netzsch.com

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…data for chemical processes.
…optimization based on kinetics analysis.

…sis: "ICTAC Kinetics Committee recommendations for analysis

…ftware. In this webinar our expert Dr. Elena Moukhina will …evaluation of TG and DSC data measured by NETZSCH …e will demonstrate this integration for data preparations and …nd predictions based on analysis results.

…Ceramitec trade fairs in Munich. Visit booths A1/303 and

…Measurements, Sparse Data, Automatic Reaction Type.
…nly few points for analysis? Are your data in non-standard

Summary

1. New software Kinetics Lite is developed:
   can be delivered from July 2026
2. Integration to NETZSCH **Proteus Analysis** Software is done for both **Kinetics Neo** and **Kinetics Lite**
   Minimum versions:
   Proteus Analysis 9.10
   Kinetics Neo 3.8
3. Automatic selection of reaction type is done for single-step kinetic analysis
4. Kinetics Lite contains many functions which are typically not present in the kinetic options of standard analysis software for thermal analysis data, e.g. simulated fit and R^2.

You can rely on NETZSCH.

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