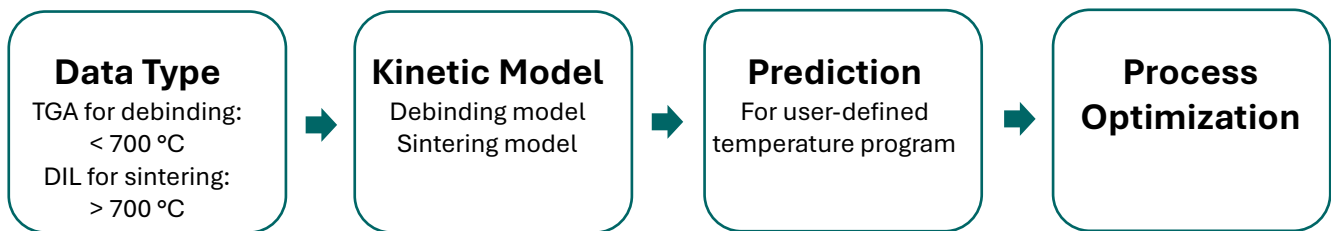




REDUCE COSTS OF CERAMIC PRODUCTION WITH KINETICS NEO SOFTWARE. HALDENWANGER (MORGAN ADVANCED) SAVED MORE THAN 50%

Create an optimal temperature profile having balanced heating to ensure the best quality material in the shortest time.



Kinetics Neo can help you:

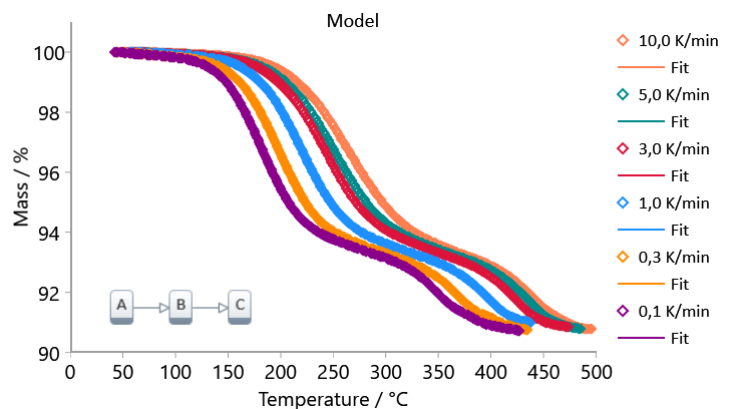
- Reducing R&D time
- Reducing the number of test-fires
- Reducing energy consumption
- Reducing scrap
- Maintaining or improving product quality
- Speeding up your time to market

I. Optimization of the Burnout Process of a Polymer Binder for Improved Product Quality

In the initial stage of the heating process, usually below 700°C, the polymer binder is carefully removed via thermal decomposition. But the evolving of gas should not be too intensive to prevent the formation of micro-cracks and ensure the structure of the original material is not destroyed.

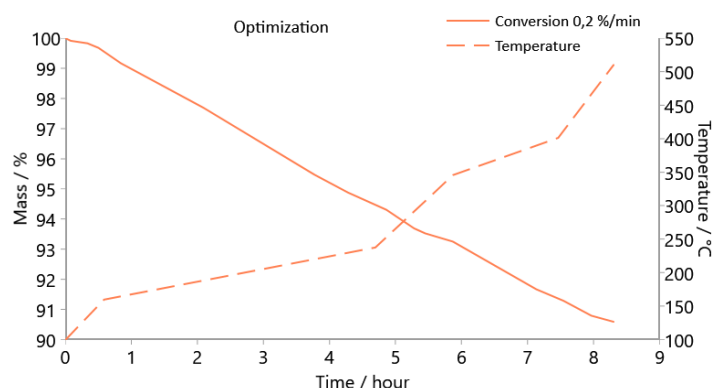
If the TG data measured under different heating rates, loaded into the simulation software *Kinetics Neo*, then the reaction kinetics can be mathematically modeled. What you get is a simulation model that reliably describes the temperature-dependent and time-dependent processes in your material.

Figure 1. TG measurements and kinetic Simulations based on the same 2-Step Kinetic Model



Optimum temperature profile is determined to ensure a favorable relationship between process duration and product quality. The 2-Step kinetic model was used for temperature optimization.

Figure 2. Optimized temperature for constant debinding rate 0.2%/min of conversion



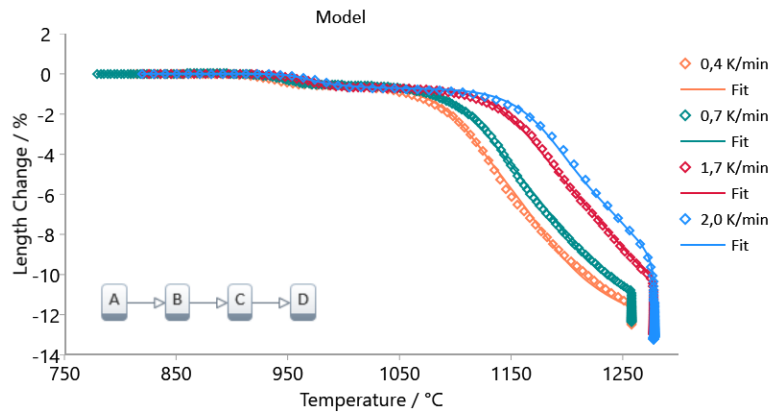


II. Optimization of Sintering Process for Improved Product Quality and Reduced Costs

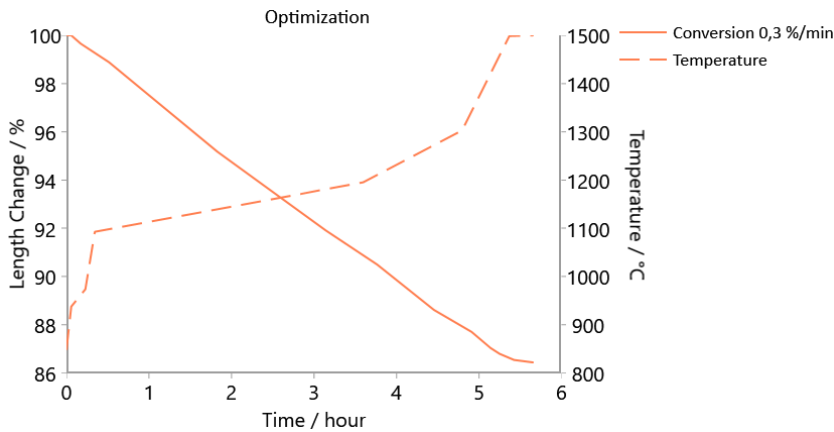
In the final stage of the heating process, usually above 700°C, the sinter process with the shrinkage takes place. The too intensive heating leads to the formation of mechanical stresses and micro-cracks. Thus, to obtain the best quality of ceramics, this heating stage with shrinkage should not be performed too quickly. However, too slow heating increases the process time, and corresponding production costs.

Sintering kinetics is mathematically modeled in Kinetics Neo software for experimental DIL data for different heating rates. Resulting simulation model reliably describes the temperature-dependent and time-dependent processes in your material.

Figure 3. DIL Curves and Simulation fit based on 3-Step Model



Sintering Simulation for any user-defined temperature program in Kinetics Neo software



It becomes possible to easily calculate the sintering process for any temperature profiles as well as to calculate the optimal temperature program for shortest sintering time by maintaining or improving the product quality.

Figure 4: Optimized temperature profile for simulated rate-controlled sintering (RCS) at a constant sintering rate 0.3%/min of conversion.

Summary

- Kinetics Neo is a tool to design optimal temperature profiles that lower ceramic production costs while preserving high product quality
- Kinetics Neo shows how debinding and sintering can be modeled from TG and DIL data to predict material behavior, cutting R&D time, energy use, test-fires, and scrap.
- For our industrial partners the production time was reduced in this way by more than 50%