Material Behavior in Process Design – Concepts and Research Topics

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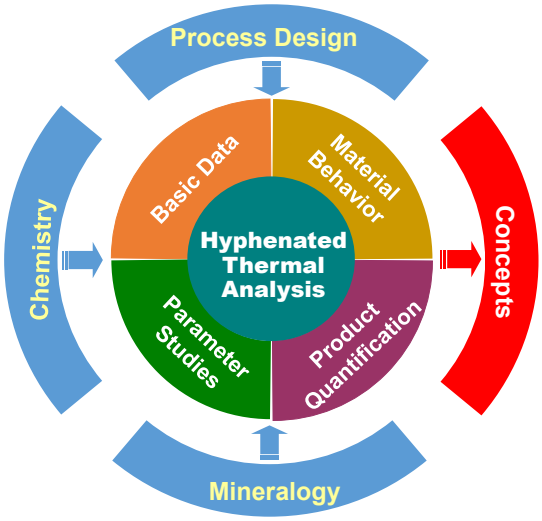
Material cycles' research in technical processes requires exchange of information between numerous scientific disciplines and data from different environments, ranging from all steps of technical processes to the environment, from input to output resp. partitioning in technical installations. However, in addition to these efforts, **basic research is needed to understand the scientific principles and mechanisms behind the observed facts.** This knowledge allows the optimisation of the ecological and economic conditions of technical processes for a sustainable use of resources and protection of the environment.



Our research field **Material Behavior in Process Design bridges the gap between basic research and technical processes**. In order to understand the dynamics and potential of novel technical processes, we carry out systematic research on the behavior of materials in significant process steps. Additionally, we study the basic physicochemical data of the materials in various and defined process conditions.

Our research projects are financed by Helmholtz-Association (HGF) and are carried out and validated in the HGF-program "Materials and Technologies for the Energy Transition (MTET)". The goal of MTET is to provide sustainable technologies for a society in which energy supply and material cycles are linked in a defossilized circular economy. This requires efficient solutions for the conversion, transport, storage and use of energy and energy sources. (https://www.mtet.kit.edu/index.php)

Our actual research emphasis is put on the development and implementation of innovative technologies to improve the energy and resource efficiency with which mineral raw materials are produced and recycled. Further topics are basic investigations for the chemical recycling of mixed plastic wastes by pyrolysis and the recycling of carbon fibers (CF) and carbon fiber reinforced plastics (CFRP). Our specific research projects aim to describe material cycles and structural features of novel materials in these processes. New thermoanalytical and spectroscopic tools are developed, applied and validated in cooperation with Deutsche Gesellschaft für Thermische Analyse (GEFTA).