

## **High-pressure polymerization technology – a supercritical fluid process on world scale**

**Professor (Dr.) Markus Busch**

**Technische Universität Darmstadt  
Darmstadt, Germany**

Low-density polyethylene (LDPE) is produced by a high- pressure process at pressures up to 3500 bar and temperatures up to 300 °C. These are extraordinary harsh reaction conditions that demand advanced process technologies and significant safety precautions. The LDPE process has been known and used over several decades; often being seen as a mature technology. Although several varieties of polyethylene have been discovered that are produced with catalysts that result in reaction conditions being milder, still the unique rheological properties of LDPE cannot be mimicked. So-called long-chain branches determine these properties. Such side branches to the main backbone are being formed by the complex reaction kinetics of free-radical polymerization, featuring inter-molecular transfer reactions to the polymer. Therefore, still LDPE has a marked share of several million tons per year worldwide. Unique material properties, commercial relevance, and demanding process technology, make this process still an attractive object of investigation.

Starting with an overview of this technology the actual trends of development will be inspected using examples. Driving forces and strategies will be elucidated. Both, experimental high- pressure technology on laboratory scale as well as computer simulation play a role in optimizing existing processes and designing new products. Product design can be done either by using new co-monomers or additives or controlling the polymeric microstructure by process conditions. Specifically, for the latter, computer simulations are extremely helpful. Combining the efficiency of deterministic methods with the accessibility of detail by Monte-Carlo methods in so-called hybrid simulation technologies, provide remarkable access to the development of polymeric microstructure for full industrial processes. It will be demonstrated how this can be used for simulation-based product development.

**When: Wednesday February 21<sup>st</sup> 9:00-10:00**

**Where: EP#255**