

Super Critical Thinking towards Sustainability

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Super critical thinking can be a meaningful approach to sustainable development for current and future generations. One of the important strategies of super critical thinking is the application of supercritical fluids which enable new, better, and green processes and products.

In this presentation, recent progress of R&D activities of supercritical fluid technology at SNU is briefly discussed.

To achieve the goal of carbon neutral, one of hot topic in petrochemical industry is plastic recycling, in which a reduction on fossil sourced feedstock for the manufacture of new plastics can be possible. Recycling of XLPE with scH₂O or scMeOH to PE and artificial marble with scH₂O or scMeOH to MMA and Al(OH)₃ will be discussed.

It will be also presented commercialization of supercritical facility for polyester dyeing without water. In the supercritical dyeing process where CO₂ is used as a solvent, there is no wastewater generated. During the dyeing fabrics with various dyes, it is important to know when the dyeing process will be completed. Another issue is the removal of excess dyes during the washing process. I would like to deal with these issues. After dyeing process, dried textiles can be obtained without additional drying process, which makes the process energy efficient.

Supercritical drying is an essential process in case micro-structure should be preserved. It will be introduced various fields that require a supercritical drying process: the restoration process of an ancient book like the Annals of the Joseon Dynasty, and the drying of biopharmaceuticals and nanoparticles.

Last topic is supercritical process for synthesis of biodiesel. In the process, hydrogenation catalyst may be utilized to improve biodiesel fuel specification. Other example to improve supercritical biodiesel process with a catalyst will be presented.