

### **364e Mixing and Segregation of Slurries for Catalyst Production**

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Slurries of kaolin (clay) and zeolite (aluminum silicate) have the tendency to segregate during the production of catalyst supports. Zeolite and kaolin in the form of very fine powders (on the order of  $10\mu\text{m}$ ) are mixed with water to produce a slurry. The slurries are filtered and then extruded to make a support with a high surface area as well the required thermal and mechanical properties. Improper mixing or segregation can lead to a non-uniform product with poor performance. To better understand mixing and segregation, mixtures of zeolite, kaolin and blue art sand are being studied in a cylinder with a pitched blade impeller, both experimentally and with a two fluid model, at varying concentrations, impeller speeds, and scales. A dyeing process has been developed for the zeolite powder that allows us to track the zeolite in mixtures with kaolin. The incomplete mixing of kaolin and the formation of a zeolite rich region on the surface of kaolin/zeolite slurries have been observed. Segregation patterns have also been observed in zeolite/sand mixtures. We have observed path dependent behavior (hysteresis), which can result in unexpected mixing behavior. Poor mixing is seen at very low impeller speeds because the small zeolite particles are easily fluidized while the larger sand particles remain at the bottom of the cylinder. However, high impeller speeds can also result in poor mixing. If the impeller speed is lowered from high to medium, segregation occurs, resulting in a poorly mixed product. These observations can be explained based on the competition between centrifugal and gravitational forces.