CFD simulation of Taylor-Couette Reactor with axial flow for particle classification

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A Taylor-Couette reactor as an altermative to common mixing devices using impellers is often used for mixing, for example, in a bioreactor or a chemical reactor. This type of reactor has also been recently applied in the filed of crystallization due to its unique flow characteristics. In the crystallizatoin process, it is usually important to produce crystals with narrow size distribution due to the properties of final products and reduction in energy and cost in post-treatment. One of the methods to narrow crystal size distribution is classifying crystal by size. Many researchers have been studied Taylor-Couette reactor to apply to particle classification. However, the previous studies only limit to certain operating conditions in which vortices are stationary and are not suitable for applying to the crystallization process.

In this study, the dynamic characteristics of particles in Taylor-Couette flow was investigated using commercial CFD software(Fluent). Operating conditions to determine whether vortex moves or not were found by simulations and validated with experiments. Also, a new design of Taylor-Couette reactor was suggested and simulated for classification of particles by size in crystallization process.