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Simulation of Photocatalytic Degradation of Rhodamine B in Annular Photocatalytic Reactor

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Abstract : Simulation of a photocatalytic reactor helps in understanding the complex behavior of the photocatalytic degradation. Simulation also aids the designing and optimization of the photocatalytic reactor. Lack of simulation strategies is a huge hindrance in the commercialization of the photocatalytic technology. With the increased performance of computational resources, and development of simulation software, computational fluid dynamics (CFD) is becoming an affordable engineering tool to simulate and optimize reactor designs. In the present paper, a CFD (Computational fluid dynamics) model for simulating the performance of an immobilized-titanium dioxide based annular photocatalytic reactor was developed. The computational model integrates hydrodynamics, species mass transport, and chemical reaction kinetics using a commercial CFD code Fluent 6.3.26. The CFD model was based on the intrinsic kinetic parameters determined experimentally in a perfectly mixed batch reactor. Rhodamine B, a complex organic compound, was selected as a test pollutant for photocatalytic degradation. It was observed that CFD could become a valuable tool to understand and improve the photocatalytic systems.

Keywords : simulation, computational fluid dynamics (CFD), annular photocatalytic reactor, titanium dioxide
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