P1 Approximation for Modelling an Annular Photocatalytic Reactor

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1.- Abstract

Heterogeneous photocatalysis with titanium dioxide (TiO_2) is one of these processes, which uses ultraviolet radiation (UV) to activate reactions leading to the degradation of polluting agents in water. For the development and scaling up of efficient photocatalytic processes it is important to model the absorption and transport of radiation in the reactor volume. We have developed an analytical model to evaluate radiation distributions inside an annular photocatalytic reactor, based on the P1 approximation of radiative transfer theory. The modeled geometry consists of two concentric tubes with a TiO_2/water suspension flowing in the annular space between them, and a lamp at the center of the inner tube. The theoretical results are compared with experimental data from measurements of radiation transmission through several observation windows in the reactor wall. In general the model describes the observed experimental trends.

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