

210e Reaction Kinetics and Modeling of the Aerosol Thermal Decomposition of ZnO in for Solar Thermochemical Production of H₂

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The Zn/ZnO solar thermochemical hydrogen production cycle includes the thermal dissociation of ZnO as the high temperature solar step. Experiments were conducted to investigate the reaction kinetics for dissociation of fine ZnO powders ($< 1 \mu\text{m}$) in an aerosol flow reactor. Arrhenius temperature parameters were determined, and a mechanism-appropriate kinetic rate law was determined. This experimentally determined kinetic rate law was applied to a finite element numerical model of such a reactor in “on-sun” conditions, allowing calculation of optimal reactor design specification and operating conditions. Experiments were performed in such a reactor on-sun as validation for this model, and the results are reported.