Quasi Steady-State Modeling and Analysis of Diffusion-Controlled Dissolution from Monodisperse Spheroidal Particles

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Abstract

A quasi steady-model of the dissolution of a single prolate or oblate spheroidal particle has been developed based on the exact solution of the steady-state diffusion equation for mass transfer in an unconfined media. With appropriate treatment of bulk concentration, the model can predict the detailed dissolution process of a single particle in a container of finite size. The dimensionless governing equations suggest that the dissolution process is determined by three dimensionless control parameters, initial solid particle concentration, particle aspect ratio, and the product of specific volume of solid particles and saturation concentration of the dissolved species. Using this model, the dissolution process of felodipine particles in a broad range of space of the three control parameters are analyzed and some characteristics are identified. The effects of material properties indicated by the product of specific volume and saturation concentration are also analyzed.

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