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Chemical reaction kinetics in practice

The chemical reactions taking place in the chemical reactor form the heart of any chemical process. Reaction kinetics are the translation of our understanding of the chemical processes into a mathematical rate expression that can be used in reactor design and rating. Because of the importance of correct and safe design of chemical reactors, chemical reaction kinetics is a key aspect of research and development in chemical industries, in research institutes, and academic centers, as well as in industrial laboratories. There is, and there will always be, a strong need for knowledge and a skill base concerning the determination of reaction kinetics and their application in the form of a kinetic model.

This paper is a result of cooperation within Eurokin, a consortium of over 10 European companies and 4 universities. An industrial questionnaire in 1995 highlighted that industry is not only a little conservative in the methods it uses to determine kinetics, but also that there was a wide awareness of the scope for improvement. Eurokin was thus founded in 1998 to try and establish the best practices and to facilitate development work in kinetics and associated areas.

The paper briefly explains some underlying theory of heterogeneously catalyzed chemical reactions and their kinetics. It deals specifically with the acquisition of kinetic data, and gives recommendations for the selection of the experimental reactor and conditions. A primary aim of this paper is discuss kinetic experimentation and modeling through a series of case studies, attempting to illustrate good practice, methods in kinetic modeling, pitfalls, and recommendations. The paper closes with some recommendations and a perspective on the future needs of industrial reaction kinetics.

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