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Dissolution of uranium dioxide in nitric medium, towards a macroscopic model of reactors.

Florence CHARRIER 1, Delphine CANION 1, Philippe MARC 1, Alastair MAGNALDO 1, Sophie LALLEMAN 1, Gilles BORDA 2, Éric SCHAER 2

1 CEA, Nuclear Energy Division, RadioChemistry & Processes Department, SERA, Laboratory of dissolution study, F-30207 Bagnols-sur-Cèze, France.
1 CEA, Nuclear Energy Division, Technology of Fuel Cycle Department, SGCS, Laboratory of civil engineering and instrumentation, F-30207 Bagnols-sur-Cèze, France.
2 Laboratory of Reactions and Process Engineering, UMR 7274, CNRS, Université de Lorraine, 54001 Nancy, France

Introduction

Dissolution plays an important part at the head of many industrial processes. It is a key step for the recycling of rare metals and also uranium dioxide, mainly present in spent nuclear fuel. However, heterogeneous reactions are particularly complex in those cases as they are triphasic and catalyzed by one of their products.

Dissolvers could be optimised with a good knowledge of the physico-chemistry implied in this kind of reactions. Hence, this work focuses on developing a model of the reactor including all the characteristics of the dissolution and their effects on the kinetics.

Our approach

Comprehension of phenomena involved in the dissolution

Kinetic study without influence of heat transfer and mass transport

Model for the local kinetic rate

Application of the kinetic model to ideal reactors

Simulation of hydrodynamics in real dissolvers

Comparison with experimental results

Application of the model to more elaborated reactors

- Recycling of nitric acid

- Recombination of gas

Conclusions and perspectives

Such a multiscale model for the dissolution kinetic will enable to:
- Optimize actual dissolvers,
- Develop innovative reactors for recycling of metals or spent nuclear fuel.

References


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