

# MODELLING THE RATE INHIBITING EFFECT OF WATER AS A PRODUCT ON REACTIONS CATALYSED BY CATION EXCHANGE RESINS

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## ABSTRACT

When water is a product in organic liquid phase reactions catalysed by cation exchange resins, it has a significant inhibiting effect on the reaction rate. This fact is confirmed by reaction rate data on the formation of mesityl oxide from acetone as well as tetrahydrofuran from butanediol over cation exchange resins. Water is a reaction product in both systems. In this work, the inhibiting effect is ascribed to the preferential association of the catalytically active sites with water. In the derivation of the kinetic model, a Freundlich type adsorption isotherm was used to quantify the number of sites occupied by water. This is combined with a power law expression for the reaction rate per available equivalent acid site. The rate expressions derived in this manner for the acetone and the butanediol systems respectively, accurately models the temperature dependence of the reaction rate as well as the rate with different water concentrations in the initial reaction mixture. The same approach, but with the Langmuir adsorption isotherm for site deactivation failed to predict the rate when water was added to the mixture.