

Phenolphthalein Kinetics

2006

TO: Engineering Development Branch

FROM: Engineering Division

SUBJECT: Phenolphthalein Kinetics

The reaction of phenolphthalein with a base solution follows the 2 reaction sequence given below.



Reaction 1 is very fast and can be assumed to be instantaneous.

We are considering using phenolphthalein as an indicator to determine the residence time of several large CSTR reactors in the pilot plant (see Fogler chapters 13-14). Please determine the kinetic parameters for reaction 2 with respect to phenolphthalein associated with the fading of phenolphthalein in sodium hydroxide solutions (order, k, and E_a). Please use a temperature range of 60 - 120 °F. What is the heat of reaction as a function of temperature within a 95% confidence level? What are the corresponding equilibrium constant values.

How do you propose to do an analysis, i.e., what concentrations will you measure in order to obtain kinetic information? What do you know about the kinetics of the above reaction sequence that allows you to use this approach?

References:

- Andres and Hile, Chem. Eng. Education, Winter 1976, pp. 18-22.
- Barnes, M.O. and LaMer, V.K., J. Amer. Chem. Soc., 64, 2312, (1942).
- Chen, P.T.Y. and Laidler, K.J., Canad. J. Chem., 37, 599, (1959).