

Thesis Title A Study of Complex Chemical Oscillations in the Pseudo-closed System of Belousov-Zhabotinsky Reaction

Name Methasit Pornprompanya

Degree Master of Science (Physical Chemistry)

Thesis Supervisory Committee

Prapin Wilairat	Ph. D.
Orapin Rangsiman	Dr. rer. nat.
Preedeepon Limcharoen	Ph. D.
Waret Veerasai	Dr. rer. nat.

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ABSTRACT

In the investigation of the complex oscillations of intermediates bromide and cerium ions by potentiometric method in a pseudo-closed system of cerium(IV)-catalyzed Belousov-Zhabotinsky reaction at a constant temperature of $30.0 \pm 0.1^\circ\text{C}$, malonic acid and cerium(IV) concentrations were 0.44 and 0.00133 M, respectively, and bromate concentration was increased: 0.093, 0.105 and 0.118 M in 1.00 M sulfuric acid. A number of transient phenomena including mixed-mode (MM) and intermittency(I) oscillations were observed in between two series of simple oscillations. When the sulfuric acid concentration was reduced from 1.00 to 0.500 M, the complex transient oscillations were no longer observed. There were only damped simple oscillations with 1-3 cycles of period-doubled oscillations.

The induction period was independent of the bromate concentration employed in this study, but it decreased significantly when the sulfuric acid concentration was reduced from 1.00 to 0.500 M.

The complex oscillations could only be reproduced in a qualitative manner as they have shown to be very sensitive to the concentrations of the major reactants in the reaction.