



*Int. J. New. Chem.*, 2020, Vol. 7, Issue 3, 195-219.

## International Journal of New Chemistry

Published online 2020 in <http://www.ijnc.ir/>.

Open Access

Print ISSN: 2645-7236

Online ISSN: 2383-188x



### Original Research Article

## Investigation the Kinetics of CO<sub>2</sub> Hydrate Formation in the Water System + CTAB + TBAF + ZnO

Seyed Esmail Mousavi<sup>1</sup> and Alireza Bozorgian<sup>1</sup> \*

<sup>1</sup>\*Department of Chemical Engineering, Mahshahr Branch, Islamic Azad University, Mahshahr, Iran

*Received: 2019-09-24*

*Accepted: 2020-01-15*

*Published: 2020-03-28*

### ABSTRACT

In this study, the kinetics of gas hydrate formation in the presence of tetra-n-butyl ammonium fluoride (TBAF) and cetyl trimethyl ammonium bromide surface active ingredient (CTAB) with zinc nano oxide (ZnO) are investigated and the most important kinetic parameters of hydrate formation such as their induction time and storage capacity were measured. The kinetic experiments were carried out in a constant volume temperature method in a high pressure reactor. The storage capacity of carbon dioxide hydrate in water in the presence of ZnO and surfactants at different temperatures, pressures and concentrations of TBAF and CTAB additives was calculated and measured using time induction measurements. The results show that with increasing pressure and decreasing temperature, the storage capacity of CO<sub>2</sub> in hydrate increases. Finally, statistical analysis of the parameters affecting the induction time of hydrate formation showed that zinc oxide can reduce the induction time of hydrate formation compared to other additives.

**Keywords:** Butyl Ammonium Fluoride, Zinc Nano Oxide, Storage, Hydrate