SODIUM CYANATES SYNTHESIS FROM UREA AND SODIUM CARBONATES USING TRICHLOROBENZENE AS A SOLVENT

Name: Tontowi Ismail
Nrp: 2301.301.005
Advisor: Prof. Ir. Renanto Handogo, Ms., PhD
Co-Advisor: Dr. Ir. Mahfud, DEA

ABSTRACT

Experiment on sodium cyanates synthesis from urea and sodium carbonates using 1,2,4-trichlorobenzene (TCB) addition as a solvent has been conducted in a batch reactor which is equipped with mixer, heating jacket and exhausted gas system. TCB and natrium carbonates were dewatered at 130°C as an initial pretreatment, followed by additional urea gradually. Temperature was adjusted to 140°C and the remaining urea was fed to the mixing system for 1.5 hours. Urea dissolved in TCB while sodium carbonates were not. Then, temperature of reaction was varied from 140°C to 200°C and held for 2.5 hours under atmospheric conditions. Using the moles ratio of urea to sodium carbonates of 2/1 and the mass ratio of TCB to urea of 5/1, at 200°C, the highest sodium cyanates content in product was 93.4% mass. Maximum yield sodium cyanates produced was 0.976 mol/mol urea and 1.96 mol/mol sodium carbonates. The process was carried out in a heterogeneous system, there was a mass transfer of dissolved urea to the surface of sodium carbonates particles. Solid product of sodium cyanates were accumulated on the surface of sodium carbonates particles. The shrinking core model was applied to the modeling of the synthesis process. The model calculations gave a good agreement with the experimental data.

Key words: sodium cyanates, sodium carbonates, urea, trichlorobenzene solvent, batch reactor, shrinking core model