Dissolution Kinetics of Aluminum Can in Sec-butyl Alcohol for Aluminum sec-butoxide

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A kinetic study of dissolution reaction of Al can waste was conducted for the synthesis of Aluminum sec-butoxide (ASB). With the used Al can and sec-Butyl alcohol (SBA) as reactants, the reaction was examined at the condition of 3mol SBA/mol Al of stoichiometric ratio, adding 10-3mol HgI2/mol Al for catalyst and no agitation at the reaction temperature ranging from 70 to 100℃. After 24 hours, the reaction gave a 75% yield. A two-stage dissolution mechanism was proposed in which the dissolution rate is determined first by a chemical reaction and then by ash layer diffusion. On the basis of the shrinking core model [1], the chemical reaction rate equation on the shape of Al can was established: XA=kc inf from 0 to t (1-XB)dt. The concentration of SBA was added to the reaction at the stoichiometric ratio, then it was largely changed through the dissolution reaction. Therefore, since the conversion rate SBA varies greatly depending on the reaction time, it was included as an integral term of the reaction time. In the second stage, the dissolution rate is controlled by diffusion control through the ash layer. The rate equation was established toXA^2=kA inf from 0 to t (1-XB)dt.