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Kinetics of Hydrogen Sulfide Removal from Biogas Using Biofilm on Packed Bed of Salak Fruit Seeds

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Abstract : Sulfur-oxidizing bacteria were isolated and then grown on salak fruit seeds forming a biofilm on the surface. Their performances in sulfide removal were experimentally observed. In doing so, the salak fruit seeds containing biofilm were then used as packing material in a cylinder. Biogas obtained from biological treatment, which contains 27.95 ppm of hydrogen sulfide was flown through the packed bed. The hydrogen sulfide from the biogas was absorbed in the biofilm and then degraded by the microbes in the biofilm. The hydrogen sulfide concentrations at a various axial position and various times were analyzed. A set of simple kinetics model for the rate of the sulfide removal and the bacterial growth was proposed. Since the biofilm is very thin, the sulfide concentration in the Biofilm at a certain axial position is assumed to be uniform. The simultaneous ordinary differential equations obtained were then solved numerically using Runge-Kutta method. The values of the parameters were also obtained by curve-fitting. The accuracy of the model proposed was tested by comparing the calculation results using the model with the experimental data obtained. It turned out that the model proposed can describe the removal of sulfide liquid using bio-filter in the packed bed. The biofilter could remove 89,83 % of the hydrogen sulfide in the feed at 2.5 hr of operation and biogas flow rate of 30 L/hr.

Keywords : sulfur-oxidizing bacteria, salak fruit seeds, biofilm, packing material, biogas
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