ABSTRACT

The zeolite SUZ-4 membrane was synthesized for using in reduction of NO. Firstly, the zeolite SUZ-4 crystals were synthesized via Sol Gel hydrothermal process using rice husk ash (RHA) as co-raw material altogether with other chemicals. A mullite tube was used as a support for SUZ-4 membrane. Before spin-coating in SUZ-4 colloidal solution, the tube was modified its surface charge by pretreatment with polyamine solution. After varying coating time and concentration of polyamine solution, it was found that the optimum coating time was 15 minutes with 4 wt.% polyamine solution. The obtained SUZ-4 membrane was 20 μm thickness having 0.058 wt.% of the support. In addition, the thickness of the membrane was increased about 20 μm for each re-spin-coating. The synthesized SUZ-4 membranes have the specific surface areas in the range of 17.6-23.1 m^2/g and its pore size distribution reveals tri-modal distribution having the average size in the range of 20-80 Å.

Gas permeation performances of the zeolite SUZ-4 membrane was investigated for single gases (H_2, CO, O_2, N_2 และ NO) and mixed gases (H_2/ NO, H_2/ N_2, H_2/ O_2, CO/ NO, CO/ N_2 และ CO/ O_2) at 30-150°C. Under this temperature range, the mass transfer of tested gases was dominated by a surface diffusion through adsorbed gas molecules. Subsequently, when the temperature increased the mass transfer rate was decreased due to lesser amount of adsorbed molecules. The separation performance of binary system was increased with increasing temperature until it reached maximum at a certain point and then it decreased. Comparison of observed selectivity to ideal selectivity of binary gas, it was found that they have the same trend. However, the values are unequal because there is an interaction between both gases for the real circumstances. In addition, at 120-150°C a reduction of NO by H_2 occurred and interfere the permeance of H_2/ NO. For testing No reduction at 350 °C, the average NO conversion of 50 % was achieved. This value is still lower than that of packed bed reactor tested under the same condition.

Key words: zeolite SUZ-4 membrane, rice husk ash, gas permeation, NO reduction