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DOT BOONYANURAK: SILICA MEMBRANE FILTER FOR RURAL AREA. THESIS

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In the present research, the improvement of ceramic filter for rural area was studied by Sol-Gel technique. Silica was coated on support surface to form the silica membrane. The sol solution was prepared from 3 chemicals: sodium silicate solution, water, and concentrated sulfuric acid. The sodium silicate solution was synthesized from rice husk ash.

To investigate the influence of chemicals ratio on the gel time, the concentration of sodium silicate was varied between 0.015-0.055 % by mole per volume and the mole ratio of concentrated sulfuric acid and sodium silicate was varied between 0.6-7. It was found that the increase of the concentrated sulfuric acid volume and sodium silicate ratio decreased gel time. The optimal sodium silicate concentration and molar ratio of concentrated sulfuric acid were 0.025 % by mole per volume and 7, respectively.

According to the variation of sol solution viscosity with respect to time. It was illustrated that sharply increased at the beginning. Therefore the reaction rate has to be decreased by adding the water in the solution to remain the solution viscosity. In this experiment, decreasing the reaction rate has performed at 3 viscosities (300, 600 and 100 centipoise). It could remain the solution viscosity by adding water 50 % of the initial volume. Moreover the variation of viscosity with time affect to the particle size of sol. The enhancement of the viscosity caused the increasing of the sol particle size. The optimal viscosity for the preparation of sol solution was 600 centipoise, which resulted in 1 micrometer of sol solution. The supports coated by sol solution provide smaller pore size because the sol solution would penetrate in to pore.

The effect of dipping time was observed by changing the dipping time between 2 to 60 second and 2 to 60 minutes. It was found that the longer dipping time, the smaller porosity was observed. The dipping time of 2 seconds filter had more small volume change than other long dipping time filters.

Flux and rejection of particle in ground water (average size 0.1-0.5 micrometer) yeast (average size 5 micrometer) and bacteria *Alcaligenes eutrophus* NCIMB 11599 (average size 2 micrometer) from four microfilters (Thick-non coated microfilter, Thin-non coated microfilter, Thin-non coated microfilter with dipping time of 2 seconds and Thin-non coated with dipping time of 60 seconds) were compared in order to get a suitable microfilter for rural area. The result showed that coated microfilter with dipping time of 2 seconds provide the higher particle, yeast and bacteria rejection than ordinary microfilter at nearly the same flux. In addition, the characteristic of improved microfilter was surface filter.