INTISARI

Konsentrasi yang tinggi dari kelarutan silika dalam larutan *geothermal* menyebabkan masalah dalam pengoperasian produksi uap di PLTP Dieng. Mitigasi silika *scaling* diperlukan untuk mengurangi resiko kegagalan produksi uap. Dalam penelitian ini, asam silika dalam larutan geothermal direaksikan dengan kalsium hidroksida ($Ca(OH)_2$) membentuk *n ano calcium silicate* (NCS). Tujuan penelitian ini adalah membentuk endapan NCS dari surfaktan SLS dan $Ca(OH)_2$ ke dalam larutan geothermal. Mempelajari perubahan suhu (30, 50 dan 70°C), pH (7, 8 dan 9), dan konsentrasi surfaktan (0,05, 0,15 and 0,30% (w/v) serta mengetahui kondisi optimum. Pengujian yang dilakukan yaitu pengendapan partikel yang dilakukan di gelas ukur vertical, densitas padatan, densitas larutan, viskositas, dan diameter rata-rata partikel yang mengendap ditentukan dari persamaan diameter stokes. Kemudian membandingkan hasil perhitungan dari diameter stokes dengan *particle size analyzer* (PSA). Konsentrasi silika yang terlarut dapat diukur dengan metode *spectroscopy* dan komposisi padatan di uji dengan instrumen EDX dan FTIR. Hasil penelitian menunjukkan bahwa silika terlarut dalam larutan geothermal berkurang dan dapat dikontrol dengan penambahan $Ca(OH)_2$ dan penambahan surfaktan SLS. Semakin besar konsentrasi surfaktan maka ukuran partikel akan semakin kecil. Pembentukan NCS dapat dihasilkan dan disertai juga dengan partikel silika dan garam. Kondisi optimum pembentukan NCS terjadi pada suhu 30 ^{o}C pH 9 dan konsentrasi surfaktan SLS 0,30 %w/v.

Kata kunci : Larutan *geothermal*, *nano calcium silicate*, pengendapan, sodium lignosulfonat

ABSTRACT

High concentration of dissolved silica in geothermal brine frequently causes operational problem in production of steam for electric generation. Mitigation of silica scaling is necessary to reduce the risk of steam production failure. In the present work, silicic acid in Dieng geothermal brine was reduced by introduction of calcium hydroxide that lead to formation of insoluble nano calcium silicates (NCS). The purpose of this work was to control size of the precipitated NCS by introducing surfactant sodium lignosulfonate (SLS) as surfactant in the $Ca(OH)_2$ added geothermal brine. The effect of temperature (30, 50 and 70 °C), pH (7, 8 and 9), and surfactant concentration (0.05, 0.15 and 0.30% (w/v)) on the particle size of the resulting NCS was studied to obtain the optimum operating condition. The precipitation-sedimentation behavior of the resulting particles was measured in a vertical tube. Having measured the solid density and solution density and viscosity, average diameter of the precipitated particles was determined using stoke's principle. The calculated particle size was the compared with measurement result using particle size analyzer (PSA). The soluble silica concentration in the solution was measured using spectroscopy method while composition of the resulting solid particles was measured using EDX and FTIR. Experimental results showed that the dissolve silica in Dieng geothermal brine can be reduced and controlled with the addition of $Ca(OH)_2$ and surfactant SLS. The greater the concentration of surfactant SLS, the smaller the resulting particle size. It was found that the formation of NCS particles was accompanied with precipitation of silica and salts. The optimum condition of NCS formation was at temperature 30°C and pH 9 while the concentration of surfactant SLS added to the brine was 0.3 % (w/v).

Keywords: geothermal brine, nano calcium silicate, precipitation, sodium lignosulfonate.