ABSTRAK

STUDI PENAMBAHAN CAMPURAN EKSTRAK KEMENYAN, GAMBIR, DAN ASAP CAIR CANGKANG KELAPA SAWIT SEBAGAI INHIBITOR KERAK KALSIUM KARBONAT ($CaCO_3$)

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Kerak kalsium karbonat ($CaCO_3$) merupakan masalah utama dalam sistem perpipaan industri karena dapat mengurangi efisiensi operasional. Penelitian ini bertujuan untuk mempelajari pengaruh dan efektivitas campuran ekstrak kemenyan, gambir, dan asap cair cangkang kelapa sawit sebagai inhibitor kerak $CaCO_3$ serta menentukan komposisi campuran inhibitor terbaik.

Penelitian ini menggunakan metode *seeded experiment* dengan konsentrasi larutan pertumbuhan $CaCO_3$ yang digunakan yaitu 0,025; 0,0375; 0,050; dan 0,0625 M, dan dengan perbandingan konsentrasi inhibitor ekstrak kemenyan dan asap cair cangkang kelapa sawit dibuat tetap yakni 50 dan 250 ppm sedangkan pada ekstrak gambir dibuat bervariasi yakni 100, 150, 200, 250, dan 300 ppm.

Penambahan inhibitor pada larutan pertumbuhan 0,025 M dengan perbandingan konsentrasi campuran inhibitor terbaik yakni 1:6:5 menghasilkan efektivitas sebesar 63,19%. Hasil karakterisasi menggunakan *Scanning Electron Microscope* dan *X-Ray Diffraction* menunjukkan adanya perubahan morfologi kristal $CaCO_3$, pada kerak tanpa penambahan inhibitor terdapat fasa kalsit dan aragonit, dan setelah penambahan inhibitor terdapat adanya fasa baru yaitu fasa vaterit yang mudah larut dalam air sehingga mudah dihilangkan. Distribusi ukuran partikel kerak $CaCO_3$ menggunakan *Particle Size Analyzer* menunjukkan adanya penurunan ukuran partikel kerak $CaCO_3$, sebelum menggunakan inhibitor dengan nilai rata-rata yaitu 70,92 μm kemudian turun menjadi 64,3 μm setelah penambahan inhibitor.

Kata kunci: kemenyan, gambir, asap cair cangkang kelapa sawit, kalsium karbonat, inhibitor

ABSTRACT

THE STUDY OF ADDITION A MIXTURE OF FRANKINCENSE AND GAMBIER EXTRACT, AND PALM SHELL LIQUID SMOKE AS A CALCIUM CARBONATE ($CaCO_3$) SCALE INHIBITOR

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Calcium carbonate ($CaCO_3$) scale is a major problem in industrial piping systems because it can reduce operational efficiency. This research aims to examine effectiveness of a mixture of frankincense and gambier extract, and palm shell liquid smoke as a $CaCO_3$ scale inhibitor and to determine the best composition of the inhibitor. This research used a seeded experiment method with $CaCO_3$ growth solution concentrations of 0,025; 0,0375; 0,050; and 0,0625 M, and the concentration ratio of the inhibitor extract of frankincense and liquid smoke from palm kernel shells was kept constant at 50 and 250 ppm, while the gambir extract was varied at 100, 150, 200, 250, and 300 ppm. The addition of inhibitor to 0,025 M growth solution with an inhibitor ratio of 1:6:5 had the best effectiveness of 63.19%.The results of characterization using Scanning Electron Microscope, and X-Ray Diffraction show a change in the morphology of $CaCO_3$ crystals, there are calcite and aragonite phases before using inhibitors and after using inhibitors there is a new phase, namely the vaterite phase which is easily soluble in water, so it is easy to remove. The particle size distribution of $CaCO_3$ using Particle Size Analyzer shows a decrease, particle size distribution before using the inhibitor with an average value of 70,92 μm to 64,3 μm after the addition of the inhibitor.

Keywords: frankincense, gambier, palm shell liquid smoke, calcium carbonate, inhibitor