

ABSTRAK

STUDI PENAMBAHAN EKSTRAK BUAH MENGGUDU (*Morinda citrifolia*) DAN ASAP CAIR CANGKANG KELAPA SAWIT SEBAGAI INHIBITOR KERAK KALSIUM SULFAT (CaSO_4) MENGGUNAKAN METODE *SEEDED EXPERIMENT*

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Pada proses peindustrian, saluran pipa air dapat menimbulkan adanya pembentukan kerak. Potensi kerak salah satunya disebabkan oleh garam CaSO_4 yang ditemukan dalam hampir semua jenis saluran air sehingga menyebabkan terganggunya aliran akibat pengecilan diameter pipa dan menghambat aliran fluida pada sistem pipa tersebut. Oleh karena itu, dalam penelitian ini telah dilakukan pengujian inhibitor campuran ekstrak mengkudu dan asap cair cangkang kelapa sawit (MA) pada kerak kalsium sulfat (CaSO_4) menggunakan metode *seeded experiment* pada variasi konsentrasi larutan pertumbuhan CaSO_4 sebesar 0,0250; 0,0375; 0,0500; dan 0,0675 M yang diujikan pada variasi perbandingan konsentrasi inhibitor MA 1:5, 3:5, 5:5, dan 7:5.

Efektivitas tertinggi terjadi pada konsentrasi larutan pertumbuhan CaSO_4 0,0250 M dengan perbandingan konsentrasi inhibitor campuran MA 7:5 diperoleh persentase sebesar 155,46 %. Berdasarkan hasil analisis kualitatif menggunakan *Scanning Electron Microscopy* (SEM) dan *X-Ray Diffraction* (XRD) menunjukkan bahwa kerak CaSO_4 tanpa penambahan inhibitor seperti batang menumpuk dengan ukuran besar dan panjang yang terdiri dari fasa gipsum dan basanit, sedangkan setelah penambahan inhibitor permukaan kristal lebih pendek, tidak merata, dan rapuh yang terdiri dari fasa gipsum dan basanit dengan intensitas menurun, serta muncul fasa baru anhidrit. Analisis kuantitatif menggunakan *Particle Size Analyzer* (PSA) menunjukkan bahwa kerak CaSO_4 sebelum dan setelah penambahan inhibitor mengalami penurunan ukuran kristal yakni nilai rata-rata (*mean*) dari 123,29 μm menjadi 109,81 μm dan nilai tengah (*median*) dari 104,14 μm menjadi 43,14 μm . Sehingga inhibitor campuran MA dapat digunakan sebagai penghambat kerak CaSO_4 .

Kata Kunci: asap cair cangkang kelapa sawit, ekstrak mengkudu, CaSO_4 , kerak, inhibitor

ABSTRACT

STUDY OF THE ADDITION OF NONI FRUIT EXTRACT (*Morinda citrifolia*) AND PALM OIL SHELL LIQUID SMOKE AS A CALCIUM SULFATE (CaSO_4) SCALE INHIBITOR USING THE SEEDED EXPERIMENT METHOD

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In industrial processes, water pipes can cause scale formation. One of the potential scales is caused by CaSO_4 salts which are found in almost all types of water pipes, causing flow disruption due to reducing pipe diameters and inhibiting fluid flow in the pipe system. Due to these problems, this research was carried out by testing the inhibitor mixture of noni extract and palm oil shell liquid smoke (MA) was tested on calcium sulfate (CaSO_4) scale using the seeded experiment method at varying concentrations of the CaSO_4 growth solution of 0.0250; 0.0375; 0.0500; and 0.0675 M tested at various ratios of MA inhibitor concentrations of 1:5, 3:5, 5:5, and 7:5. The highest effectiveness occurred at the concentration of 0.0250 M CaSO_4 growth solution with a ratio of 7:5 mixture inhibitor MA concentration, yielded the effectiveness percentage value of 155.46 %. Based on the results of qualitative analysis using Scanning Electron Microscopy (SEM) and X-Ray Diffraction (XRD), showed that the CaSO_4 scale without the addition of inhibitors such as rods that were piled, large-sized, and elongated consisting of gypsum and basanite phases, while after the addition of inhibitors, the crystal surface looked shorter, smaller size and fragile consisting of gypsum and basanite phases with decreased intensity, and a new anhydrite phase appears. Quantitative analysis using the Particle Size Analyzer (PSA) showed that the CaSO_4 scale after the addition, the inhibitors had decreased the crystal size with the average value (mean) from 123.29 μm to 109.81 μm and the middle value (median) from 104.14 μm to 43.14 μm . In conclusion, the mixture inhibitor (MA) can be used to overcome CaSO_4 scale inhibitors.

Keywords: palm oil shell liquid smoke, noni extract, CaSO_4 , scale, inhibitors