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The Use of Indonesian *Kemenyan* Extract to Control Calcium Carbonate (CaCO₃) Scale Formation

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Abstract:

One of the most serious problems encountered in Indonesian Oil Company especially in geothermal industry is the formation of scale (undesired crystal growth) on surface of industrial equipment. This scaling impact on the efficiency of the equipment, and because of this, the Indonesian Oil Company (PT PERTAMINA) has spent US\$ 6–7 million to renew every pipeline at the Geothermal Industry every 10 year [1,2]. In this research, it was carried out the effect of *Kemenyan* extract from *Styrax Benzoin* Dryand resin as green inhibitor on calcium carbonate (CaCO₃) scale formation using unseeded method to control the CaCO₃ scale formation at temperature of 80 °C and in the growth solution concentrations of 0.050. The investigation of the morphology of CaCO₃ crystal resulted was identify using SEM and the particle size distribution of the CaCO₃ crystal produced was determined by particle size analyzer. The experiment result shows that the *Kemenyan* extract can be used as natural inhibitor of calcium carbonate scale formation and change the morphology of CaCO₃ crystals (Fig. 1). The addition of *Kemenyan* extracts in various concentrations of this inhibitor and in the the CaCO₃ growth solution concentration of 0.05 M produces percentage of inhibition ability from 14 to 60 % in inhibiting the formation of CaCO₃ scale (Table 1). The ability of the *Kemenyan* extract to control the growth rate of CaCO₃ scale formation was determined by an amount of the inhibitor concentration added and the growth solution concentration of CaCO₃ as a crystal growth media for calcium carbonate crystal under these experiment conditions [3].

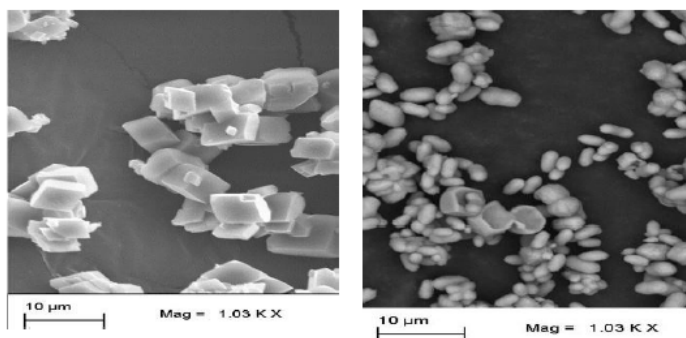


Fig. 1: Morphology of CaCO₃ crystal (a) without and (b) with the addition of inhibitor.

Table 4. Inhibitor effectiveness in inhibiting CaCO₃ scale formation

Inhibitor concentration (ppm)	Inhibitor effectiveness (%)
50	14.23
150	28.45
350	59.78

Keywords: Calcium carbonate, Natural inhibitor, *Kemenyan*, Scaling.

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