Study of a polyether-based carboxylate inhibiting CaSO$_4$·2H$_2$O and CaCO$_3$ in cooling water system

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**ABSTRACT**

A kind of polyether-based copolymer, AA-TPEO, was synthesized using isooamyl alcohol polyoxyethylene ether, oxalic acid and acrylic acid. In this article, AA-TPEO was prepared at different mole ratios. After that, the synthesized polymer was characterized by Fourier-transform infrared (FT-IR) firstly. And further verification was done through $^1$H NMR. Then, the molecular weight and its distributed situation were investigated by GPC. All of above consequences demonstrated that the synthetic experiment was successful. This work mainly aimed at investigating the impact of AA-TPEO’s mole ratios and the agent concentration on scale inhibition efficiency of the copolymer for CaSO$_4$·2H$_2$O and CaCO$_3$ scales. From the results of the static scale inhibition experiments, it was known that AA-TPEO was a kind of efficient scale inhibitor. At the same time, its performance was compared with different inhibitors which were common on the market under the same conditions. The morphology and structure of deposits was confirmed by SEM, XRD and FT-IR. From the SEM photos, it could be seen that the surface appearance of CaSO$_4$·2H$_2$O and CaCO$_3$ scales changed. The proposed inhibition mechanism of the copolymer was also described and analyzed briefly in this work.

**Keywords:** Calcium carbonate; Calcium sulfate dihydrate; Non-phosphorus; Polymer; Scale inhibitors