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Kappa-carrageenan as an attractive green substitute for polyacrylamide in enhanced oil recovery applications

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Abstrak

The rapidly growing demand for petroleum resources has become a crucial global problem. Therefore, a more realistic solution is required for oil production. Enhanced oil recovery (EOR) has become an essential technique to extract original oil content and maintain oil fields. During this process, certain viscous polymers are commonly used as mobility control agents. In this work, we introduce a new class of polymer to address the limitations of commercial EOR polymers. We successfully extracted kappa-type carrageenan from Eucheuma cottonii seaweed using demineralized water and ethanol precipitation. The amount of yield, intrinsic viscosity, and viscosity-average molecular mass of the extracted carrageenan were 18.64%, 12.77 dLg-1, and 4.716×105 gmol-1, respectively. Characterizations were done by dynamic viscosity and rheological measurement, along with a thermal degradation test. The measurements indicated that kappa-carrageenan is an attractive green substitute for polyacrylamide, as it showed relatively high resistance to temperature, shear rate, and salinity compared to polyacrylamide-based commercial EOR polymers. However, a higher concentration of carrageenan is still needed to reach the same viscosity as the commercial polymers.