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Tannic Acid-Modified Poly(acrylamide-*co*-acrylic acid): A Versatile Approach for Aqueous Viscosity Modulation

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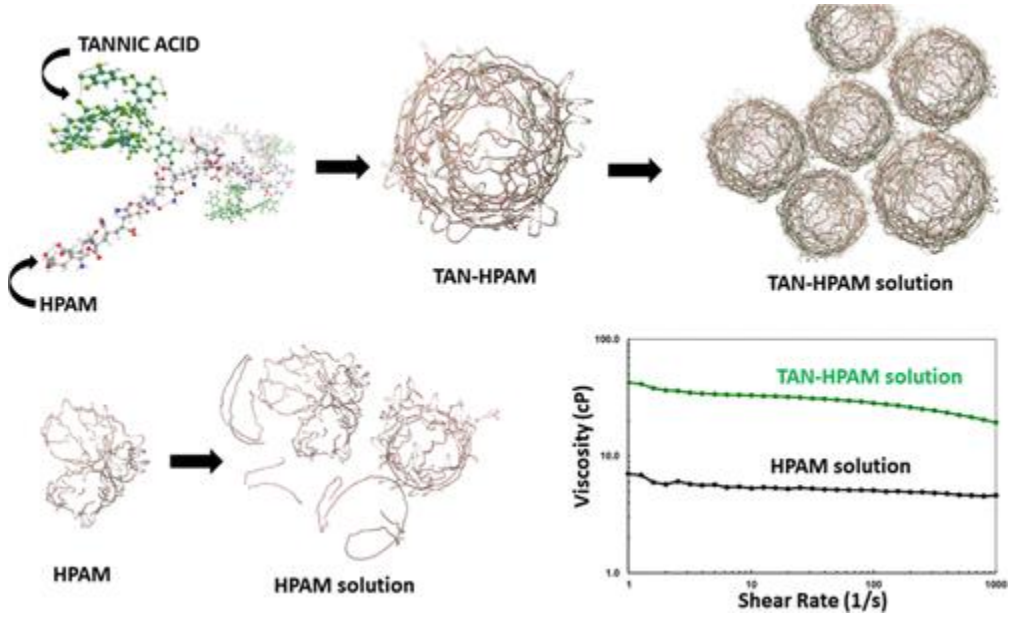
Abstract

This study focuses on the synthesis of a polymer through the grafting of tannic acid onto poly(acrylamide-co-acrylic acid). The main goal is to generate polymers with lateral branched structures with the versatile bonding abilities associated with tannic acid and then study their ability to modify the viscosity of aqueous solutions for potential application in enhanced oil recovery. The synthesized macromolecules were characterized using Fourier transform infrared spectroscopy, 1H-nuclear magnetic resonance spectroscopy, ultraviolet–visible spectroscopy, size exclusion chromatography coupled with multi-angle light scattering and differential

refractive index detection, as well as fluorescence spectroscopy. These techniques were employed to confirm and quantify the incorporation of tannic acid. The results showed that adding 0.4, 4.0, and 10.0% w/w tannic acid in the reaction mixture produced polymers with incorporations of the branched monomer ranging from 0.06 to 6.92% w/w. The rheological properties of aqueous solutions of the obtained polymers indicated changes in the intra- and intermolecular interactions that were also interpreted by density functional theory simulations. Results showed that the viscosity of the solutions was at least 4.4 times higher than that of the original poly(acrylamide-co-acrylic acid) in water.



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En el siguiente enlace https://pubs.acs.org/doi/suppl/10.1021/acsapm.3c03056/suppl_file/ap3c03056_si_001.pdf se encuentra disponible para su lectura: Supporting Information. Geometry optimization and TD-DFT calculation of gallic acid, acrylic acid, and acrylamide, as well as computational setup and complete description of TD-DFT results (S1); additional dynamic light scattering and size exclusion chromatography with multiangle light scattering (S2); and differential refractometer index detector results of the obtained polymers