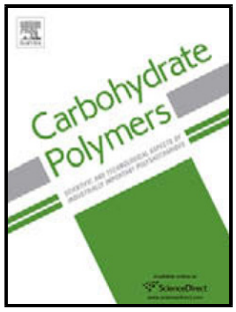

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Self-assembly and rheological behaviors of intermacromolecular complexes consisting of oppositely charged fluorinated guar gums

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HIGHLIGHTS:

- We synthesized fluorinated cationic/anionic guar gums (FCGG and FAGG, respectively)
- We characterized these species by various techniques
- Highest viscosity was observed at FAGG:FCGG mass ratio of 7.0:3.0 (COMP)
- FAGG-FCGG interactions increased molecular weights (maximum observed for COMP)
- These also induced shape factor reducing, leading to natural macromolecules curling

Abstract: We synthesized fluorinated cationic/anionic guar gums (FCGG and FAGG) and characterized these species using Fourier transform infrared spectroscopy and ^{1}H nuclear magnetic resonance spectroscopy. The degree of fluorine substitution of FCGG (0.26%) and FAGG (0.21%) was calculated by elemental analysis. In addition, we explored the self-assembly and rheological behaviors of FCGG-FAGG complexes by viscometry, scanning electron microscopy, light scattering, fluorescence spectroscopy, and rheometry. The maximum viscosity and molecular weights were observed with a FAGG:FCGG mass ratio of 7.0:3.0, denoted by COMP. Moreover, FAGG-FCGG interactions in COMP led to the lowest shape factor and critical associating concentration. Additionally, the relaxation time and crossover modulus of COMP (6.65 s and 0.90 Pa, respectively) were remarkably higher than those of FCGG and FAGG alone. Finally, viscoelastic hysteresis loops emerged for FAGG and COMP. The results suggested that the self-assembly behaviors of FAGG-FCGG were influenced by both ionic and fluorinated groups.