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Structure and phase behavior of aqueous methylcellulose solutions JOHN MCALLISTER, PETER SCHMIDT, TIMOTHY LODGE, FRANK BATES, University of Minnesota — Cellulose ethers (CE) constitute a multi-billion dollar industry, and have found end uses in a broad array of applications from construction materials, food products, personal care products, and pharmaceuticals for more than 80 years. Methylcellulose (MC, with the trade name METHOCEL^{TM}) is a CE in which there is a partial substitution of –OH groups with –OCH_3 groups. This results in a polymer that is water-soluble at low temperatures, and aqueous solutions of MC display gelation and phase separation at higher temperatures. The nature of MC gelation has been debated for many years, and this project has made significant advances in the understanding of the solution properties of CEs. We have characterized a fibrillar structure of MC gels by cryogenic transmission electron microscopy (cryo-TEM) and small angle neutron scattering (SANS). Using light scattering, turbidity measurements, and dynamic mechanical spectroscopy (DMS) we report that MC microphase separates by nucleation and growth of fibril aggregates, and is a different process from LCST phase separation.

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