



~~Special Polymer Physics Seminar ~~

Dr. Robert L. Sammler

The Dow Chemical Company
Material Science and Engineering Laboratory
Midland, MI 48674

**10:00 AM Tuesday,
February 8th, 2011
301 Steidle Bldg.**

The role of interchain entanglements in the thermal gelation of aqueous methyl cellulose

**R. L. Sammler, O. D. Redwine, J. Moore, D. Poche, D. Meunier,
J. Sherman, and M. Rinken**

Cellulosic ether (CE) materials are important today in food, pharmaceutical, industrial and construction applications, and commonly used in formulations as binders, thickeners, lubricating agents, water retention agents, and/or excipients. They are often based on cellulose obtained from renewable sources (wood pulp, cotton linters, etc.), designed to be water soluble, and able to form gels when aqueous solutions are warmed. These materials are noted for their immense diversity of chain compositions and molecular weights, which severely limits rapid development of structure property relationships.

Critical to the design of new CE materials is an improved understanding of the thermal gelation mechanism. The impact of interchain entanglements is explored with a set of commercial and developmental methyl cellulose materials. Aqueous solutions were studied at selected concentrations above and below their chain overlap concentration c^* at 20 °C or as they were warmed from about 5 to 90 °C at 1 °C/min. Solutions were found to be able to gel only when the chains were entangled ($c/c^* > 1$, $M/M_e(c) > 1$). Such criteria were used to design solution-prepared methyl cellulose materials able to gel in hot water; such materials are commonly thought to be incapable of thermal gelation.