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Rheological investigation of methylcellulose thermogelation using cone & plate rheometer

David Mastropietro, Srinath Muppalaneni M S and Hossein Omidian
Nova Southeastern University, USA

It is commonly known that aqueous solutions of methylcellulose transition into a semisolid gel upon heating. This thermogelling property is reversible upon cooling, and is believed to occur due to favored hydrophobic interactions at higher temperatures. Such thermo-responsive properties can be utilized in designing controlled drug delivery platforms to entrap and to release drug at above and below the sol-gel transition temperature, respectively. The transition temperature depends on different factors such as the degree of substitution and concentration of methylcellulose in solution. As such, the temperature at which gelation occurs is an important characteristic to determine. We investigated the use of a Wells-Brookfield cone & plate rheometer to measure the thermorheological properties of aqueous solutions of methylcellulose (Methocel A4C). Studies were performed using a standard cup with an embedded temperature probe and a cone of radius 2.4cm, angle of 0.8° and shear rate of 7.50N sec-1. Temperature sweeps were performed between 35 and 66°C. The cone/plate rheometer requires a small sample size (0.5ml), and therefore allows for a rapid and precise testing. The Methocel solution viscosity decreased marginally with an increase in temperature up to a critical value, over which a sharp increase in viscosity was seen. The critical temperature was found very consistent with that reported in the literature based on other test methods such as turbidity.

Biography

David Mastropietro received his B.S. in Pharmacy from Massachusetts College of Pharmacy in 1999. He is completing his Ph.D. in Pharmaceutics at Nova Southeastern University (NSU) with dissertation work focused on abuse-deterrent dosage-forms. Srinath Muppalaneni earned a B.S. in Pharmacy from Andhra University (2008) and a M.S. in Pharmaceutical Sciences from Campbell University (2010). Srinath is currently a second year Ph.D. student at NSU in Pharmaceutics. Hossein Omidian has a M.Sc. in Chemical Engineering and a Ph.D. in Polymer Science. He is currently an Associate Professor at NSU where David and Srinath are both part of his research group. http://pharmacy.nova.edu/aboutus/Omidian.html

dm1627@nova.edu