**Rheological behaviour of micellar casein concentrates solutions**

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Micellar casein concentrates (MCC) are valuable food ingredient because of their nutritive value and physicochemical and functional properties. Rheological properties of MCC are very important and have high relevance for any new food application1. In this study, the aim was to evaluate the steady shear rheological of MCC under a ranger of concentration (4%, 8%, 10%, 12% and 15%), temperatures (4ºC, 10ºC, 22.5ºC, 33ºC y 55ºC) and shear conditions (100 s-1, 200s-1, 300s-1, 400s-1 and 500 s-1). Results showed that Power law model gave a good fitting. The analysis of the flow behaviour index (n) suggested that MCC solutions exhibited a Newtonian behaviour a low concentration and high temperature. However as temperature decrease and concentration increases, MCC showed a tendency to shear thinning behaviour (15% at 55 ºC; 12% & 15% at 33ºC; 12% & 15% at 22.5ºC; 10%,12% & 15% at 10ºC and 10%, 12% & 15% at 4ºC). Temperature had a significant effect on the apparent viscosity (ηapp) of MCC since ηapp decreases with increasing temperature at all casein concentration. The effect of temperature on viscosity of MCC is described using an Arrhenius-type relationship. The values of Ea for the concentration (4%, 8%, 10%, 12% and 15%) were in the ranges of 8.4kJ/mol; 9.4 kJ/mol; 12.0 kJ/mol; 28.4 kJ/mol and 43.7 kJ/mol, in agreement with reported previously2. The effect of temperature became more pronounced above this concentration range. The apparent viscosity at 300s-1 at all concentration of MCC increased with increasing casein concentration at all temperatures but this increase in viscosity was more pronounced for the 15% MCC. The increase in apparent viscosity with concentration followed and exponential relation-ship. A mathematical model capable of accurately predicting the viscosity based on temperature and concentration has been established, where concentration is the most dominant factor.

References:

 Nelson, B.K. & Barbano, D. (2005). A Microfiltration Process to Maximize Removal of Serum Proteins from Skim Milk Before Cheese Making. *Journal of Dairy Science*, 88, 1891-1900. 10.3168/jds.S0022-0302(05)72865-4.

 Sauer, A., Doehner, I. & Moraru, C.I. (2012). Steady shear rheological properties of micellar casein concentrates obtained by membrane filtration as a function of shear rate, concentration, and temperature. *Journal of Dairy Science*, 95 (10), 5569-5579.