**Understanding Sodium Carboxymethyl Cellulose (Na CMC) behaviour: a rheology and light scattering study**

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Sodium Carboxymethyl Cellulose (Na CMC) is widely used in the industry to provide structure control to formulated food products (and others). For instance, it helps in maintaining bread moisture, in controlling the viscosity of beverages and in stabilising emulsions. Na CMC is a linear negatively charged water-soluble polymer derived from cellulose. Its behaviour in water is known to be very complex and a function of several parameters including the characteristics of the polymer itself such as molecular weight and degree of substitution as well as the solution concentration and dissolution conditions (e.g. addition order of the system components). While Dynamic Light Scattering (DLS) has been widely used to study the behaviour of polyelectrolytes, relatively few DLS studies have been conducted on Na CMC and, to our knowledge, none in pure water. Moreover, for relatively concentrated solutions, no oscillatory data has been collected over a wide enough range of frequencies to reveal the terminal zone (i.e. low-frequency region). The aim of the present study was to investigate the behaviour of Na CMC chains (Mw = 700,000 g/mol; DS = 0.9) in pure water using both DLS and rheology measurements. Viscosity measurements were run to identify the different concentration regimes (see Figure 1), facilitating comparisons to the behaviour typically found for polyelectrolytes. DLS and oscillatory measurements were then performed to cover the four concentration regimes. Preliminary results have shown interesting correlations between both rheology and light scattering measurements.



*Figure 1 – Specific viscosity (ηsp) as a function of Na CMC concentration*

*η0: zero-shear viscosity (obtained from the Carreau model); ηs: solvent viscosity (experimental value); the values below the names of the different concentration regimes are the expected exponents of the power laws of the specific viscosity as a function of the polyelectrolyte concentration; the values above the curve are the best fit slopes. Though the experimental exponents are slightly higher than the theoretical ones, they are in agreement with the literature about Na CMC1,2.*

*References:*

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