Rheology of Sodium Caseinate Solutions

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Abstract

The effects of monovalent and divalent salts on the rheological properties of solutions of a commercially available sodium caseinate, Alanate 180, were studied by shear sweep and oscillatory rheological methods using a Bohlin rheometer at a caseinate concentration of 14 % w/w.

The logarithm of apparent viscosity of sodium caseinate solutions increased linearly with increases in added ionic strength (AIS) at both 25°C and 50°C. Linear regression models were calculated for each monovalent salt. The slope of the regression models for each salt, at a given temperature, followed the Hofmeister series. The increase in apparent viscosity between 0 and 0.2 AIS was proportionately larger than all increases caused by further salt additions.

The apparent viscosity of sodium caseinate solutions increased with divalent salt concentration until a maximum was reached. Increasing the salt concentration above that necessary for maximum apparent viscosity resulted in a decrease in apparent viscosity followed by precipitation. The apparent viscosity of a given solution with or without added divalent salt was an order of magnitude lower at 50°C than at 25°C.

Sodium caseinate solutions with added monovalent salts formed thermo-reversible gels at 5 °C. The effect of NaCl concentration on the gelation characteristics of sodium caseinate solutions was investigated. The gel-sol transition temperature was found to increase with increasing salt concentration.

The effects of salts on the rheological behaviour of sodium caseinate gels and solutions are discussed in terms of water activity, electric

double layers, protein-water interactions and current rheological theory.

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Table of Contents