A VISCOSITY ANALYSIS OF THE EQUINE SERUM ALBUMIN AQUEOUS SOLUTIONS IN DILUTE, SEMI-DILUTE, AND CONCENTRATED RANGE OF SOLUTIONS

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The viscosity of equine serum albumin (ESA) aqueous solutions has been measured at temperatures ranging from 5°C to 45°C in the mono-disperse range, i.e. in a range of concentrations up to 367 kg/m^3 and at pH value (pH 7.4) outside of the isoelectric point. The measurements were performed with an Ubbelohde-type capillary microviscometer. At each measured temperature, a master curve relating the specific viscosity to the reduced concentration, i.e. the intrinsic viscosity and the solute concentration product, reveals – in the log-log plot – the existence of three ranges of concentrations: dilute, semi-dilute, and concentrated solutions region. In the dilute and concentrated region the plot is linear. In the semi-dilute domain the plot is non-linear and the relative viscosity can be described then by Lefebvre's equation, in which the Mark-Houvink-Kuhn-Sakurada (MHKS) exponent is a parameter. It is an indicator of protein conformation in solution. The obtained values of the MHKS exponent decrease slowly from 0.316 ± 0.007 (5°C) up to 0.312 ± 0.006 (45°C). So, in the frame of error estimation they are identical. The boundary concentration between dilute to semi-dilute solution changes from 38.2 kg/m^3 (5°C) up to 40 kg/m^3 (45°C), and the boundary concentration between semi-dilute to concentrated solution changes from 300 kg/m^3 (5°C) up to 330 kg/m^3 (45°C). The slope in the concentrated region of the master curve is, in turn, an indicator of protein stiffness and it decreases from 7.79 (5°C) up to 6.45 (45°C). These values and the values of MHKS exponent indicate that ESA molecules in aqueous solution behave as hard quasi-spherical particles. However, their stiffness decreases with increasing temperature.