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Rheological and electrical characteristics of erythrocyte suspensions in the presence of linear and micellar polyacrylic acid based species

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Abstract

The study of different types of nanomaterials increases progressively in relation to their huge application in various fields of biology, medicine and technology. The aim of the work is to study the influence of the shape and molecular weight of two types of polymer species on the rheological behavior and electrical properties of red blood cell (RBC) suspensions. The species present: (i) linear poly(acrylic acid) with average molecular weights M_n=225000 Da, 20000 Da and 6000 Da (PAA) and (ii) stabilized polymeric micelles with a mixed shell of PAA and poly(ethylene oxide) (PEO) blocks. The apparent RBC suspensions viscosity η is measured applying the rotational viscometer LS30 Contraves. RBC suspensions electrical conductivity σ is measured in parallel at a steady flow conditions by means of electrorheological techniques, which includes a resin replica of the Couette type measuring system MS 1/1 of the rheometer with a pair of platinum electrodes embedded into the wall of the measuring cup. These two parameters were considered as characteristics of the changes in the RBC suspensions' structure and cell interactions. The obtained results showed that the addition of the studied PAAs and micellar nanoparticles influences the apparent viscosity and electrical conductivity of RBC suspensions. The rheological and electrical properties of the RBC suspensions display direct relation with the shape, molecular weight, concentrations and the type of the added polymer species.

Keywords*:* RBC suspensions, polymeric nanoparticles, apparent viscosity, blood conductivity