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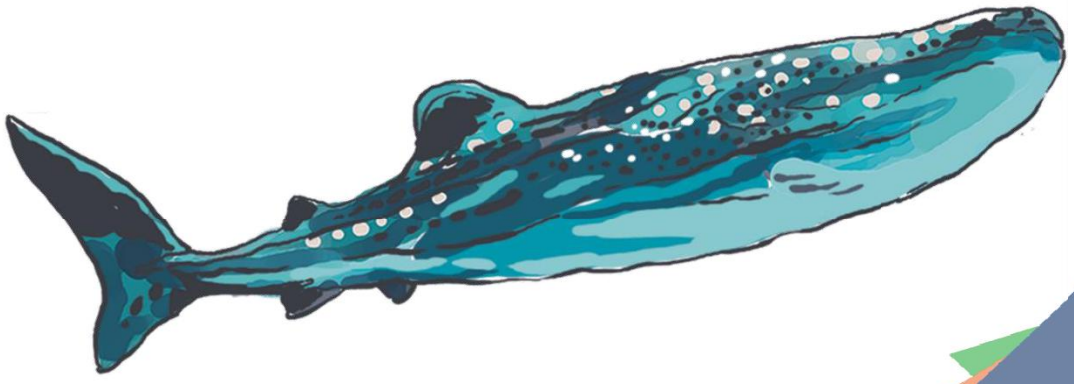

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Electrokinetic potential of nanoporous glasses of various compositions in aqueous electrolyte solutions

A.S. Kuznetsova[1,2], L.E. Ermakova[1], A.V. Volkova[1], and T.V. Antropova[2]

[1]St. Petersburg State University, St. Petersburg, 199034, Russia
[2]Grebenshchikov Institute of Silicate Chemistry, Russian Academy of Sciences, St. Petersburg, 199034, Russia

Presenting author email: a_kuznetsova95@mail.ru

High-silica nanoporous glass (PG) is product of through acid leaching of two-phase alkaline-borosilicate glass of a certain composition, containing various compounds at the surface of pore channels, are the objects of continuous study. In this work, iron-containing PGs were produced by introducing an iron (III) oxide into the batch when melting sodium borosilicate glass. PGs produced in this way are essentially membrane materials of a new generation, important for various practical applications. In this paper the structural properties and electrokinetic potential of micro- and macroporous glasses (MIP and MAP, respectively) of various compositions (with (Fe-4) or without (8V) magnetite) in solutions of indifferent sodium ion Na^+ and of potassium ion K^+ specific to the silica surface are compared.

The distribution of iron over the thickness of micro-and macroporous glass Fe-4 obtained by the method of energy-dispersive X-ray spectroscopy showed that iron is fairly evenly distributed in the volume of the membranes. The iron relative content was 2.6 wt. % in microporous glasses and 6.3-10.4 wt. % in macroporous glasses. The X-ray phase analysis of 8V and Fe-4 iron-containing glasses nanopowders showed that magnetite (Fe_3O_4) phase was detected for all micro- and macroporous Fe-4 matrices. The values of the electrokinetic potential for all types of membranes were found by the methods of microelectrophoresis (ζ^S) and streaming potential (ζ^E) in 10^{-4}-10^{-1} M NaCl and KNO_3 solutions in the pH range from 1.5 to 8. Figure 1 shows that the zeta potential for iron-containing glasses is higher than for 8V, which is associated with a large surface charge of Fe-4 glass. Comparison of the electrophoretic behavior of Fe-4 glass particles in different singly charged counterions showed that as the pH shifts to the alkaline region, the $|U_e|$ values in KNO_3 solutions become less than in NaCl solutions. Thus, for iron-containing PG, the usual ratio of electrophoretic mobilities is observed – the values of $|U_e|$ decrease with increasing specificity of the counterion. Comparison of the concentration dependences of the ζ-potential for all membranes shows that the introduction of magnetite into the structure of MIP glass has practically no effect on the $|\zeta^E|$ in NaCl and KNO_3 solutions in the neutral pH range. While the $|\zeta^E|$ for Fe-4 MAP membrane are higher than for 8V PG MAP.

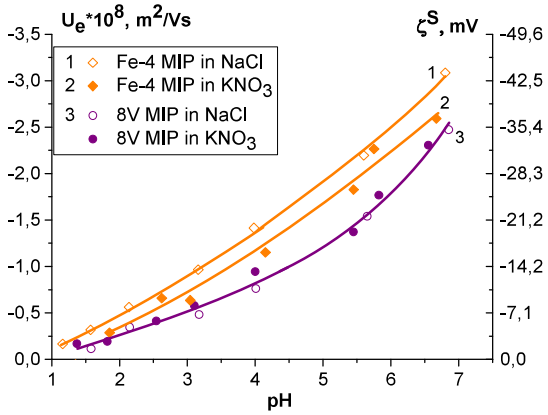

Figure 1. Electrophoretic mobility and ζ-potential of PGs in 10^{-2} M electrolyte solutions.

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