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ELECTROKINETIC CHARACTERISTICS OF POROUS GLASSES IN SOLUTIONS CONTAINING MULTIPLY CHARGED IONS (La^{3+}, Fe^{3+})

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

[1]Saint Petersburg State University, Saint Petersburg, Russia
[2]Grebenshchikov Institute of Silicate Chemistry, RAS, Saint Petersburg, Russia
Student
a_kuznetsova95@mail.ru

Porous glasses (PGs) (silica content >95%) - products of thorough chemical processing of two-phase alkali-borosilicate glasses of a certain composition - including nanoporous ones, and nanostructured systems prepared on their basis are modern functional materials distinguished by a very wide spectrum of possible fields of application, from highly active sorbents to matrices for producing composite quartzoid glasses. The analysis of the literature data shows that most of the research devoted to the study of the electrosurface properties of silicon oxide was carried out in 1: 1-charge electrolyte solutions. Therefore, it was of interest to study the specific features of the behavior (efficiency ratio α, transport numbers n_+ and ζ-potential) of micro- (MIP) and macroporous (MAP) glasses in solutions containing specifically adsorbing multivalent iron (III)[1] and lanthanum ions in a wide range of pH values and (10^{-1} – 10^{-5} M) electrolyte concentrations.

When comparing the results of the study of various three-charged ions, it was shown that the low-nitrated La^{3+} ion shows practically no specificity for the silica surface and is similar in behavior to the indifferent sodium ion. Whereas Fe^{3+} ion exhibits distinct specificity to it. It was shown that the α (equal to the ratio of the specific electrical conductivities of pore and free solutions) decrease with increasing $LaCl_3$ concentration in accordance with the decrease in the contribution of ions of double electric layer (DEL) to the electrical conductivity of the pore solution. Whereas a different dependence was observed from the classical one for $FeCl_3$ solutions. It was observed that the values of $\alpha<1$, that is, the appearance of concentration regions of the equilibrium solution, in which the electrical conductivity of the pore solution becomes less than the free one. It was also found that ζ-potential is negative in almost the entire $LaCl_3$ concentration range, while ζ-potential becomes positive already at low $FeCl_3$ concentrations (~6.5×10^{-4} M).

References

[1] Ermakova L.E., Volkova A.V., Kuznetsova A.S., Grinkevich E.A., Antropova T.V. // Colloid Journal 2018. V. 80. P. 255.

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