DISCUSSION

Reply to a Comment by P.Yu. Apel'

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The esteemed author of the Comment presents a calculation of the number of charges per unit pore surface based on the classical theory of the electrical double layer. Such calculations were performed previously as well. We called attention for the first time to the difference between the charge magnitudes determined from the streaming potential and pore conductivity when studying glass reverse-osmosis membranes [1]. Analogous results were later obtained by different authors when investigating polymer ultrafiltration and reverse-osmosis membranes, porous glasses, rocks, etc. This fact may be related to the difference between the total charge of a pore and the electrokinetic charge, which is always lower than the total charge. Moreover, it may be associated with the discreteness of charges, which is not taken into account in the classical theory of the electrical double layer. Therefore, it is quite unclear why the low charge magnitude in fine pores determined from the streaming potential must, in the opinion of the author of the Comment, serve as the evidence of the absence of these pores.

As can be seen from the title of the article, the main goal of our work was to study the electrosurface properties (surface conductivity, charge, and isoelectric point) of latent tracks in a poly(ethylene terephthalate) film irradiated with high-energy ions. We did not investigate the mechanism of gas flow through the latent tracks.

Of course, some model is required for studying the electrosurface properties. We selected the model of a cylindrical channel the wall of which is covered with a porous, loose layer. If a liquid flow inside this layer should be considered to be the surface diffusion is, in our opinion, a question of terminology.

The presence of the porous layer on the pore surface affects not only the electrosurface properties, but also the liquid flow in the pores. This can be seen from the difference between pore radii determined by the conductometric and hydrodynamic methods. The large track diameters determined from the values of electrical conductivity as compared with the values calculated from the hydrodynamic data testify that some part of a track is not involved in the liquid flow

but, at the same time, participates in the charge transfer.

Note that the properties of some samples of dry membranes after irradiation with Kr ions are very unstable. The coefficient of gas filtration through such membranes can increase or decrease with time. This phenomenon was also observed previously—in particular, in the works cited by the author of the Comment. However, for some membrane samples, the coefficient of liquid filtration stabilized after filtration at high pressures (up to 12 atm) and remained further unchanged while performing the process at low pressures. It is possible that these pressure drops facilitated the smoothing of through channels in the region of the tracks. The possibility of removal of the radiolysis products from the tracks and the formation of the channels was shown in [2–6] with the use of liquid and gas chromatography and mass spectrometry. It is such samples that we used later for studying the electrosurface properties.

Elucidation of the mechanism for the flow of different gases in latent tracks is a separate problem, and we should repeat that it was not a goal of our work.

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