

# Nanocomposites and nanomaterials

## Effect of incorporated inorganic particles on porous structure and functional properties of ion exchange polymer

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Evolution of swelling of gel-like strongly acidic resin and organic-inorganic composites based on this ion-exchanger was investigated. The methods of both water adsorption isotherms and standard contact porosimetry were applied to the research. TEM and SEM microscopy were also used. Non-aggregated nanoparticles of zirconium hydrophosphate (ZHP) were found to provide size invariability of the polymer pores, which contain functional groups (up to 20 nm), the nanoparticle aggregates squeeze these pores (down to 3 nm) [1]. Thus, the nanocomposite shows higher break-through capacity during removal of toxic ions from water, than the sample modified only with the aggregates. Swelling pressure, which is determined according to Gregor model, is proportional to the cross-linking degree. From the point of view of influence on the swelling pressure, insertion of non-aggregated ZHP nanoparticles into the ion-exchange polymer can be formally considered as an increasing of content of the cross-linking agent. Modification with aggregates is similar to a decreasing of DVB amount in the polymer. Nevertheless, in opposite to ion-exchange resins with high DVB content, the sample containing non-aggregated nanoparticles is characterized by higher rate of ion transport due to participation of counter-ions of ZHP groups and permanence of size of transport pores. During making of ion-exchange membranes, it is necessary to avoid formation of large aggregates in structure defects, since they inhibit ion transport indirectly

1. Dzyazko Yu., Ponomarova L., Volkovich Yu., Tsirina V., Sosenkin V., Nikolska N., Belyakov V. Influence of zirconium hydrophosphate nanoparticles on porous structure and sorption capacity of the composites based on ion exchange resin // Chem. Chem. Technol. - 2016. - **19**, N 3. - P. 329-335.