Adsorption of polyethene glycol and propylene glycol onto the modified glass microspheres

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Since polyethene glycol (PEG) and other derivatives of ethylene oxides are contained in the composition of medicinal and detergents, their large volumes enter water bodies. However, the issue of removing PEG and other polyatomic alcohols from the environment has not been solved yet. This research presents the adsorption of polyethene glycol (PEG) and propylene glycol (PG) on the surface of glass microspheres of the SVJ, SPJ and SMJ brands. The second virial coefficient B values in the Jones-Dole model have been calculated from the concentration dependence of dynamic viscosity for PEG and PG solutions. The strongest polymer-solvent interactions are observed in the concentration range up to 20 g/L for the initial PEG's aqueous solution. A further increase in the polymer fraction makes this interaction weaker due to a change in macromolecule configuration and the formation of overlapping areas of PEG chains. However, after adsorption on modified glasses, the strength of PEG macromolecule and water associates decreases as follows: SVJ (vinyl) > SPJ (phenyl) > SMJ (methacrylate). In the same series, the adsorption capacity of PEG varies symbiotically from 5.89 g/g (SVJ) to 0.099 g/g (SMJ). This fact can be explained by hydrogen atom mobility in the modifier's structure and the ability to form hydrogen bonds with the oxygen atom in the PEG chain. At the same time, for a PG solution, adsorbents form a series based on the degree of influence on the solute-solvent complex strength that is increasing as SMJ (methacrylate) > SVJ (vinyl) > SPJ (phenyl). However, the change in adsorption value is likely similar to that for PEG. The Jones Dole model, together with the polymer adsorption data, makes it possible to establish the priority of fixing the solute substance or solvent on the surface. To sum up, glass microspheres modified with the SVJ vinyl can be used to neutralize effluents containing polyethene glycol.