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ORAL PRESENTATION - Adsorption of selected fission products on various forms of TiO₂ nanoparticles.

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Due to the high selectivity, radiation resistance, thermal and chemical stability, inorganic ion exchangers have being widely used in the treatment of reactor coolant and aqueous nuclear wastes. Among others, inorganic sorbents, hydrous titanium dioxide are proposed as the promising inorganic sorbent for the efficient separation of fission and corrosion products such as 137Cs, 90Sr, 239,240Pu, 60Co, 65Zn and 54Mn. Recently, new forms of nanometer sized TiO2 with unique ion exchange properties were obtained. The physicochemical properties of nanostructured titanates are highlighted and the relation between properties and applications are emphasized.

In the present work we synthesized and studied ion exchange properties of TiO2 in nanotubes, nanofibers, nanowires and nanoribbons forms. The TiO2 nanostructures were synthesized using hydrothermal procedure. Material obtained has the large specific surface and internal structure of grains. The size and the shape of obtained nanoparticles were characterized by SEM and TEM methods and specific surface by BET technique.

The measurements were performed on the titanium dioxide nanotubes (diameter >5 nm, length >100 nm) nanofibers (thickness >7 nm, length >10 μm), nanowires (diameter >5 nm, length >10 μm) and nanoribbons (thickness 5> nm, length >10 μm). All synthesized samples were examined for adsorption of 137Cs and 85Sr in 0.1 M NaNO3 and KNO3 solutions. Additionally, kinetics, the dependence of the sodium salt concentration and influence of pH were examined. All nanoparticles studied show high affinity for both investigated radionuclides.

The affinity of nanotubes for Cs+ and Sr2+ was slightly higher in case of nanotubes than other TiO2 nanoparticles. The obtained results indicate a wide range of applications TiO 2 nanostructures as adsorbents for the efficient separation of fission and corrosion products from nuclear wastes.

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