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On the pH-dependent strontium adsorption by Al-PILCs, impregnated with carboxylate groups of various acid strengths

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Abstract

The impregnation of a PILC with carboxylate groups is proposed as a means to improve the adsorption properties of the material for strontium ions. The role of solution pH and carboxylate acid strength in the functionalization of the organic groups is probed by base titrations. In comparing the pristine-PILC with PILCs carrying either oxalate or acetate impregnates, enhanced strontium uptake is evidenced by the modified solids, initiated at pH 6 and 8 in the presence of oxalate and acetate, respectively. The effect on uptake is higher in the former case, amounting to an increase in strontium adsorption by a factor between two and three, depending on the pH range. To further elucidate the significance of the carboxylate acid strength in cation uptake phenomena, strontium adsorption isotherms are presented for PILCs carrying acetate, oxalate, malonate and citrate groups. The results demonstrate that, at constant pH, adsorption increases with increasing acid strength.