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Treatment of spent decontamination solutions based on citric acid with oxidic nanoparticles sorbents

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Composite sorbents based on nanoparticles of NiO, NiO-TiO₂ and ZrO₂-TiO₂ were chosen for treatment of spent decontamination solutions based on citric acid. Active oxidic materials were prepared by photoinduced synthesis (NiO, NiO-TiO₂) or hydrolytic method (ZrO₂-TiO₂). Weight distribution ratios for radionuclides ²⁴¹Am, ⁶⁰Co, ¹³⁷Cs and ⁹⁰Sr/⁹⁰Y and others were investigated in the course of the experiments performed in pH range 2–12. High sorption capacities up to 9 mmol·g⁻¹ for ¹³⁷Cs were found by sorption isotherm experiments. Dynamic experiments were performed with simulated spent decontamination solutions based on citric acid. Elution of radionuclides was tested with mineral acids (HCl, HNO₃, HClO₄) or complexing agents (citric acid, Na₃NTA, HEDP). Under suitable conditions, 85 % of radionuclide was eluted in 6 times lower volume compared to treated spent solution. Bleeding of Ni ions from active components was detected during half-scale test due to ICP-MS analysis.

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