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Synthesis of the radioisotope Mn-56@SiO₂, Sm-153@SiO₂, and Dy-165@SiO₂ hybrid nanoparticles for radiotracer

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Radioisotope hybrid nanoparticles (NPs) such as Mn-56@SiO₂, Sm-153@SiO₂, and Dy-165@SiO₂ were synthesized by neutron irradiation of the Mn-55@SiO₂, Sm-150@SiO₂, and Dy-163@SiO₂ NPs using HANARO research reactor, respectively.

The Mn-55@SiO₂, Sm-150@SiO₂, and Dy-163@SiO₂ NPs were synthesized by calcinations of the hybrid NPs, which is prepared by sol-gel reaction of tetraethyl silicate in the presence of the complex precursors, in air flow at 500 °C for 8 h.

Mn-55, Sm-150, and Dy-163 for radiotracers were selected because these elements can be easily gamma-activated from neutrons (activation limits: 1 picogram (Dy), 1-10 picogram (Mn), 10-100 picogram (Sm)).

The successful synthesis of the radioisotope hybrid NPs were confirmed via Transmission Electron Microscopy (TEM), Energy Dispersive X-ray Spectrometer (EDS), Scanning Electron Microscopy (SEM), and Gamma spectroscopy analysis, respectively.

The synthesized the radioisotope hybrid NPs could be used as radiotracers in science, environmental, engineering, and industrial fields.

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