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An external cyclotron target system for nanoparticle sample activation

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The need for toxicity assessment of industrially relevant nanoparticle materials implies that in vitro and in vivo biokinetics studies are required. Radiolabelled nanoparticles are an excellent candidate for such biodistribution measurements and are also of high interest for particle tracing and fate studies in other areas.
We describe here an external target system for direct activation of dry nanoparticle samples, with He or water cooling, which is attached to an external beamline of the JRC Scanditronix MC-40 cyclotron at Ispra, Italy. A specially designed capsule is used to hold several tens of mg of nanoparticle powder material to be irradiated. The target system design and cooling system is described, and considerations regarding energy deposition, yield, heat transfer, radiation damage and radiotracer recoil are discussed.

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