Investigation of Rhenium by Neutrons

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Modern and advanced technologies require the synthesis and use of new materials with improved and well-known properties and characteristics. In recent years, due to the unique properties of rhenium (Re) as one of the other refractory elements (Ta, Mo, W, Ti, Zr, Tc), its use worldwide has increased significantly. Rhenium is used, for example, in the aerospace industry (high-temperature W- and Mo-alloys for jet and rocket engines), the chemical industry, coating and welding, electronics, photography, nuclear medicine, etc. Rhenium is among the rarest metals on Earth and it does not occur uncombined or as a compound in a mineable mineral species. However, it is spread throughout the Earth's crust to the extent of ~0.001ppm. Production of rhenium is by extraction from the flue dusts of molybdenum smelters or by phytoextraction from soils and waters. The EXFOR experimental nuclear data library for the cross sections of (n,γ), (n,n'), (n,2n), (n,3n), (n,p), (n,α) reactions (activation, differential, total), the energy and angular distributions of the reaction products contain not many data. Some of the included datasets significantly differ from each other, others have relatively large experimental error-bars. It is proposed to start a comprehensive study of the nuclear properties of rhenium isotopes using neutrons of various energies at the Frank Laboratory of Neutron Physics (FLNP) of the Joint Institute for Nuclear Research (JINR) in Dubna (Russia). The experimental results obtained can be used to better understand the mechanism of neutron-induced nuclear reactions, as well as for the needs of nuclear, life and environmental sciences.