

NEW PROTON RADIOACTIVITIES ^{165,166,167}Ir AND ¹⁷¹Au¹

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The new proton radioactivities ^{165,166,167}Ir and ¹⁷¹Au have been observed. The Ir isotopes were produced via the ⁹²Mo(⁷⁸Kr,pxn)^{165,166,167}Ir reactions at 357 and 384 MeV. ¹⁷¹Au was produced via the ⁹⁶Ru(⁷⁸Kr,pxn)¹⁷¹Au reaction at 389 MeV. The proton emitters were each identified by position, time, and energy correlations between the implantation of a residual nucleus into a double-sided silicon strip detector, the observation of a decay proton, and the subsequent observation of a decay alpha particle from the daughter nucleus (^{164,165,166}Os and ¹⁷⁰Pt, respectively). Both ¹⁶⁶Ir and ¹⁶⁷Ir have proton-emitting ground and isomeric states, which also decay by alpha emission. The proton-decay rates have been reproduced by calculations using the WKB barrier penetration approximation and a low-seniority shell-model calculation of the spectroscopic factors. The alpha decays of the four nuclei are followed by chains of alpha decays, allowing the determination of single-particle orbital orderings. Mass information has also been obtained from the alpha-decay chains because a connection to a known mass can be obtained for one of the nuclei. Ground-state mass excesses are reported for ¹⁵¹Tm, ¹⁵⁴Yb, ¹⁵⁵Lu, ¹⁵⁸Hf, ¹⁵⁹Ta, ¹⁶²W, ¹⁶³Re, ¹⁶⁶Os, ¹⁶⁷Ir, and ¹⁷⁰Pt. The mass excess for ^{171m}Au is also given. Proton separation energies are also deduced for the odd-Z alpha daughter nuclei of the Ir proton emitters.

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