

INVESTIGATION OF ^{177}Lu 150.392 keV ISOMERIC STATE FEEDING

M.P. Stojanović, J. Simić, S. Koički

Boris Kidrič Institute of Nuclear Sciences - Vinča, Belgrade Yugoslavia

^{177}Lu is a odd-even deformed nucleus therefore in the level structure there are rotational bands built on single particle states. Maier (1) analysed the rotational bands built on single-particle states p(402) $K=5/2^+$, p(514) $K=9/2^-$ and P(411) $K=1/2^+$. The isomeric level of 150.392 keV in ^{177}Lu ($T_{1/2}=120$ ns) is the ground state of the rotational band $K=9/2^-(514)$ with levels 288.9 keV $I=11/2^-$, 451.5 keV $I=13/2^-$, 637.0 keV $I=15/2^-$ and 844.9 keV $I=17/2^-$.

The population of 150.392 keV isomeric state has been investigated using the $^{176}\text{Lu}(n,\gamma)^{177}\text{Lu}$. 5 mg of separated ^{176}Lu in form of lutetium oxide was exposed to an external horizontal filtered neutron beam of the "RA" reactor at Vinča, Belgrade. The thermal neutron flux was 4.2×10^7 neutrons $\text{cm}^{-2}\text{s}^{-1}$. The feeding of the 150.392 keV level was investigated using a γ - γ delayed coincidence spectrometer, consisting of a Ge(Li) detector with 16 cm^3 volume (FWHM 1.5 keV at 100 keV) and a NaI(Tl) scintillation detector (2).

All the transitions in band $K=9/2^-(514)$ are identified with the parameter F about 100 (F is the ratio of coincidence to single intensity, for each transitions, normalized to 100 for a transition feeding directly the isomeric state). They are 138.606 keV, 162.492 keV, 185.597 keV, 207.798 keV, 301.11 keV, 348.03 keV and 393.38 keV (1),(3),(4). The $I=19/2^-$ member of that band according to Bohr and Mottelson (5) would have an excitation energy of 1075 keV. Transitions from $19/2^-$ level to $17/2^-$ and $15/2^-$ levels would have energies of 230 and 438 keV respectively. Transitions 228.7 keV and 435.9 keV are not place in the level scheme, and they have F values about 100.

References:

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