

Energy levels in ^{139}La from the decay of ^{139}Ba

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The levels of ^{139}La have been studied through the β decay of ^{139}Ba . The radioactive sources of ^{139}Ba ($T_{1/2} = 83$ min) were obtained from the $^{138}\text{Ba}(n,\gamma)^{139}\text{Ba}$ reaction. Approximately 15mg of natural barium in the form of $\text{Ba}(\text{NO}_3)_2$ were irradiated in a thermal neutron flux of about 10^{12} n/cm².s for different periods in the IEA-R1m reactor.

The singles spectrum was studied with two independent spectrometer systems consisting of a 60 cm³ HPGe and 35 cm³ co-axial Ge (Li) detectors. The energy resolution of the HPGe was 1.8 keV at 1.33 MeV of ^{60}Co and 2.0 at 0.66 MeV of ^{137}Cs for Ge(Li). The systems were mounted inside a lead shielded hood in order to reduce the background radiation. The detectors were calibrate for energy and efficiency through the measurements of standard sources.

Two experiments of $\gamma\gamma$ coincidence were carried out. In the first one, the combination of a 89 cm³ HPGe and 45 cm³ Ge(Li) was used, each one with an energy resolution better than 2.0keV at 1.3 MeV of ^{60}Co . In the second experiment, the combination of a 75 cm³ HPGe and a 7.6cm x 7.6cm NaI(Tl) detectors was used.

The energy and intensities of 29 γ -rays have been determined. Four transitions with energies 268.27, 388.60, 1524.65 and 1900.34 keV were observed for the first time. The intensities of the β feeds were obtained from intensity balance of transitions feeding and deexciting the levels. Two new levels at 1524.65 and 1900.33 keV excitation energy are proposed and a number of γ -transitions have been confirmed.

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