New Superderformed Bands in ^{131,132}Ce *

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A high-statistics, high-fold experiment has been performed with the Gammasphere spectrometer, containing 100 HPGe detectors, in order to study the high-spin structure of ^{131,132}Ce. The ^{100}Mo(^{36}S,xn)$^{136-x}$Ce reaction was used at a bombarding energy of 165 MeV, with the beam provided by the ATLAS facility of the Argonne National Laboratory. With a trigger condition of at least seven Compton-suppressed HPGe's firing, 1.4×10^9 events were recorded in seven days of beam time. In the preliminary analysis of the data, a Radware 4-D hypercube was constructed which contained 10^{11} unfolded γ^4 coincidence events. Following a band search in the hypercube, two new superdeformed (SD) bands have been found in ^{131}Ce, making a total of four such bands in this nucleus. In the case of ^{132}Ce, at least two new SD bands have been found in addition to several shorter rotational sequences with lower moments of inertia.

Cranked Nilsson-Strutinsky calculations have been performed to assign configurations to some of the bands; the four SD bands in ^{131}Ce and the yrast (strongest) SD band in ^{132}Ce are fairly straightforward to interpret, while without neither definite spin nor parity values, the other, excited SD bands in ^{132}Ce cannot be assigned to specific structures. The main ingredients of the theoretical configurations are deformation-driving holes in the upsloping (with respect to ε_2) $\pi g_{9/2}$ orbital and particles in the downsloping $\nu i_{13/2}$ orbital. In the cerium isotopes, superdeformation occurs at $\varepsilon_2 \sim 0.35$, which is close to a prolate shape with a 3:2:2 axes ratio.

So far, it has not been possible to link any of the SD bands unambiguously into the low-spin level schemes of ^{131,132}Ce. This is particularly puzzling for the strong yrast SD band in ^{132}Ce, which carries 5% of the channel strength, and may indicate that the decay out of the SD minimum is fragmentary in the cerium isotopes. Several new, non-yrast structures have however been identified in ^{132}Ce through which the yrast SD band decays.

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