FR8400665

ISN-83-16

Université Scientifique et Médicale de Grenoble

INSTITUT DES SCIENCES NUCLÉAIRES DE GRENOBLE

53, avenue des Martyrs — GRENOBLE

ISN 83.16
May 1983

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GAMMA-GAMMA ENERGY CORRELATIONS STUDIES OF NUCLEI IN THE Xe-Ba REGION.

H. El-Samman, V. Barci, A. Gizon, J. Gizon, L. Hildingsson[1], D. Jerrestam[1], W. Klamra[1], R. Kossakowski, Th. Lindblad[1]

[1]Research Institute of Physics, Stockholm, Sweden.

Communication presented at the "International Conference on Nuclear Physics" Florence, Italy, 29 August-3 September 1983

Laboratoire associé à l'Institut National de Physique Nucléaire et de Physique des Particules.

Communication at the International Conference on Nuclear Physics,
Florence (Italy) August 1983

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Gamma-gamma energy correlations studies of nuclei in the Xe-Ba region

H. El-Samman, V. Barci, A. Gizon, J. Gizon, L. Hildingsson*, D. Jerrestam*, W. Klamra*, R. Kossakowski, Th. Lindblad*.

Institut des Sciences Nucléaires (IN2P3), Grenoble, France

The dynamic moments of inertia $J^{(2)}_{band}$ of several Xe and Ba nucleides are investigated by means of the E_γ-E_γ correlation technique. The experiments are performed using 6" x 8" hexagonal NaI(Tl) scintillators in two-dimensional coincidence arrangement on-line the Grenoble cyclotron. Ions of ^{12}C with energies between 80 and 118 MeV are used in the present experiments.

For the case of ^{122}Sn plus ^{12}C at 80 MeV, it is found that 63 % (27 %) of the intensity of the discrete lines observed with a Ge(Li) spectrometer can be associated with the ^{129}Ba (^{130}Ba) final nucleide. If the kinetic moments of inertia of the ground bands are written $J^{(1)}_{yr} = J_o + \omega^2 J_1$, the values of J_o and J_1 obtained from the discrete lines in ^{130}Ba are in good agreement with those appearing in the corresponding expression for the dynamic moment of inertia, i.e. $J^{(2)}_{band} = J_o + 3\omega^2 J_1$. This is shown in the figure (below, left) which thus includes $J^{(2)}$ as deduced from the width of the valley in the correlation matrix. It may be noted that for rotational frequencies larger than the critical value corresponding to the first back-bend, $J^{(2)}_{band}$ is fairly constant and approximately 90 % of the rigid rotor value (92 MeV^{-1}), possibly increasing to this value at $(\hbar\omega)^2 \gtrsim 0.33 MeV^2$.

For the $^{112}Sn + ^{12}C$ system at 112 MeV, the final nuclei ^{118}Xe and ^{116}Te are identified to be responsible for 38 % each of the observed discrete lines. However, here the situation is a little different. No well defined valley can be seen at low rotational frequencies, and when the valley starts to develop at $(\hbar\omega)^2 \approx 0.05 MeV^2$, it is a valley with bridges and fillings. The dynamic moment of inertia is found to exhibit a minimum at $(\hbar\omega)^2 \approx 0.1 MeV^2$, i.e. before the first back-bend of the ground-band, which occurs at $(\hbar\omega)^2 \approx 0.15 MeV^2$. For higher rotational frequencies, the moment of inertia is roughly constant and equal to 60 MeV^{-1} (cf. fig. below, right).

* Research Institute of Physics, Stockholm, Sweden