"g-Band" and "p-Band" Effective Mixture in 0^+-Band Heads

V. Paar, Prirodoslovno-matematički fakultet, University of Zagreb and "Rudjer Bošković" Institute, Zagreb, Yugoslavia
R.A. Meyer, Lawrence Livermore Laboratory, University of California, Livermore, USA

It is pointed out how for ^{110}Cd the cluster-vibration coupling generates the "g-band" and the "p-band" and their approximate mixing, thus possibly providing a general clue to the semimicroscopic theory of band mixing. Two 0^+ quasi-rotational bands[1] appear in ^{110}Cd. We describe them theoretically by coupling two proton holes to the quadrupole vibration[2]. The calculated ground-state band is composed mostly of $(g_{9/2}^{-2})$ clusters, while the 0_2^+ band is composed mostly of a combination of $(p_{1/2}^{-2})$, $(p_{3/2}^{-2})$ and $(p_{1/2}^{-1}\ p_{3/2}^{-1})$ clusters. We name these two bands the g band and the p band, respectively. The interband transitions are due to the mixing of the g- and p-bands. The g-band receives an admixture of about 10% from the p-band, and vice versa. In fact, the calculated model wave functions can be presented in an approximate way as

$$|0_1\rangle = \frac{1}{(1+\varepsilon^2)^{1/2}}\ (|0_s\rangle - \varepsilon|0_p\rangle)$$

$$|0_2\rangle = \frac{1}{(1+\varepsilon^2)^{1/2}}\ (|0_p\rangle + \varepsilon|0_s\rangle)$$

where $|0_s\rangle$ and $|0_p\rangle$ denote all linear combinations of the components involving $g_{9/2}^{-2}$ and of those involving the $(p_{1/2}^{-2})$, $(p_{3/2}^{-2})$ and $(p_{1/2}^{-1}p_{3/2}^{-1})$ configurations, respectively. With respect to the signs of the components in the corresponding wave functions, the above relations are exactly fulfilled, while the effective mixing coefficient is somewhat configuration-dependent, in the range between 1/4 and 1/2. This means that only partial averaging over the shell structure can be performed.

1) R.A. Meyer and L.K. Peker, Z.Phys. 283 (1977) 379.
2) G. Alaga, in Problems of Vibrational Nuclei (North-Holland, Amsterdam, 1975) p. 15.