Abstract

This thesis deals mainly with the effects of the proton - neutron deformation difference on the electromagnetic transitions. For this purpose the thesis is concerned with the calculations of : the energy levels, the E2- transition propabilities and the mixing ratios for even - even transitional and deformed nuclei. These calculations have been done in the framework of the rotation - vibration model and Greiner's model. The rotation - vibration model associated with a homogenous distribution for the nuclear charge, i.e. there is no proton - neutron deformation difference. On the other side Greiner's model associated with a nonhomogenous distribution for the nuclear charge, i.e. there is a proton - neutron deformation difference.

A survey on different theoretical models and on important features of the transitional and deformed nuclei is given in chapter I.

In chapter II, the general expressions for the collective nuclear Hamiltonian and the Hamiltonian operator of the rotation - vibration model are given. Also the solution of the rotation - vibration Hamiltonian, which have been done by a diagonalization treatment, is given in this chapter.

A general formula of the collective electric quadrupole transitions, in the framework of the rotation - vibration model, is given in chapter III. The general expression

of the collective magnetic dipole transition, in the frame-work of the $1^{\underline{st}}$ manipulation of Greiner's model, has been derived in this chapter. According to the $2^{\underline{nd}}$ manipulation of greiner's model, the expression of the collective electric quadrupole transition has been rewritten, again, in this chapter.

A reasonable results associated with the energy levels, the E2- transition probabilities, the mixing ratios and g_R - factor, of the ^{150}Nd, $^{152-154}Sm$-, $^{154-160}Gd$-, ^{160}Dy-, ^{166}Er-, $^{172-174}Yb$-, $^{174-180}Hf$- and $^{230-232}Th$- isotopes, have been gained. The discussion and the conclusions for these results have been given in chapter IV. From this discussion one may notice a considerable improvement for the calculated values of these nuclear phenomena as a result of considering the proton - neutron deformation difference.