EXCITED STATES IN ^{107}Ag FROM THE DECAY OF ^{107}Cd

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Gamma and X-rays following the decay of ^{107}Cd have been measured using Ge(Li) and Si(Li) detectors. Thirty-three gamma rays have been observed and placed into a decay scheme which is shown in fig. 1. The two newly established levels at 1258.8 and 1325.7 keV are probably the same ones observed by Bauvin et al. |1| at 1250$\pm$5 keV in their $^{107}Ag(\gamma, \gamma')$ experiment. The deexcitation pattern of these levels suggests a $5/2^-$ spin and parity assignment for both levels. A tentative level at 1389.8 keV has also been introduced to accommodate both the 1264.4 and 1296.9 keV gamma rays observed here. If this level indeed exists, the deexcitation pattern of this state and the logft value of the feeding favors a $7/2^+$ spin and parity. Gamma-gamma angular distribution experiments have been carried out to determine the spin of the 922.1 and 1223.0 keV levels. In these experiments a NaI(Tl) and a Ge(Li) detector have been employed. For the 324.8-597.3 keV and 324.8-898.3 keV cascades the normalized coefficients of the angular correlation function were found to be A_{22} = = 0.092$\pm$0.025, A_{44} = 0.0 and A_{22} = 0.083$\pm$0.031, A_{44} = 0.0 respectively. Assuming that the E1 898.3 and 597.3 keV gamma rays are pure and that the mixing ratio of the 324.8 keV gamma ray deexciting the 324.8 ($3/2^-$) keV level is |2| = -0.189, theory predicts A_{22} = -0.312 if J = 3/2, A_{22} = +0.078 if J = 5/2 and A_{22} = +0.39 if J = $1/2^+$. Thus the spin and parity of both levels at 922.1 and 1223.0 keV is uniquely determined to be $5/2^+$. From the present data on the deexcitation pattern of the 1258.8 and 1325.7 keV levels and the data of Bauvin et al. |1| the half life of these two states can be estimated as $T_{1/2}$ = (10$\pm$5) ps

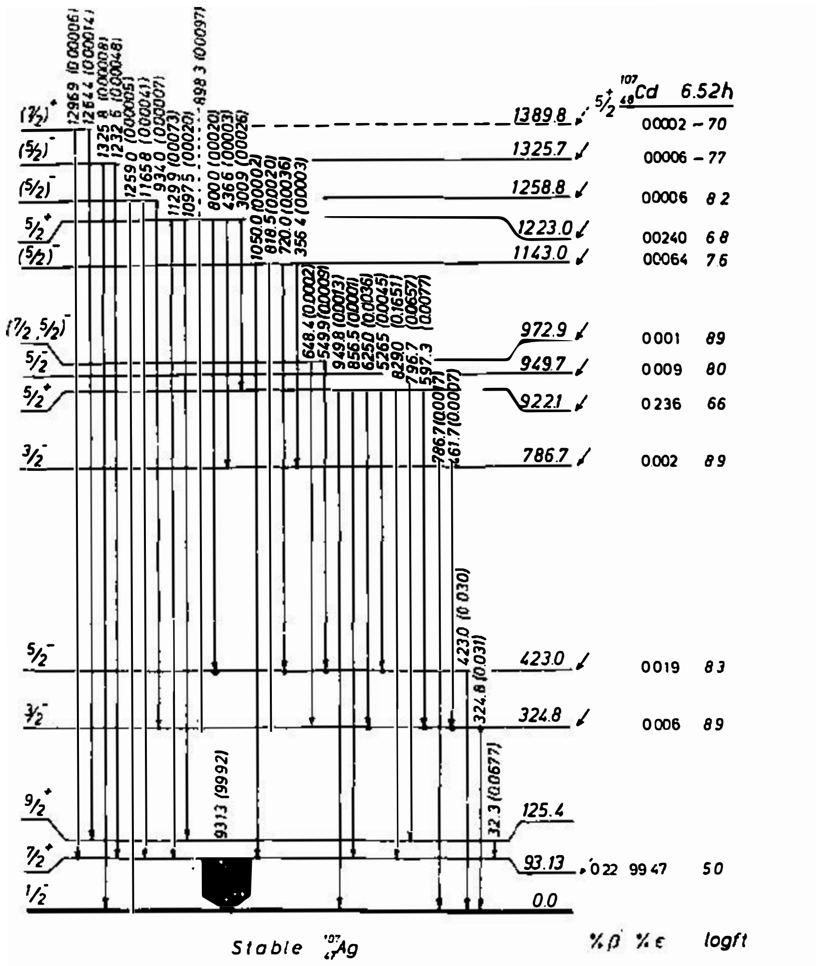

Fig.1. The decay scheme of ^{107}Cd. Numbers in parentheses are total transitions per 100 decays of the parent nucleus.

and $T_{1/2}$ = $(6.9^{+0.8}_{-2.3})$ ps, respectively. In fig. 2 the experimental level scheme of the negative and positive pa-

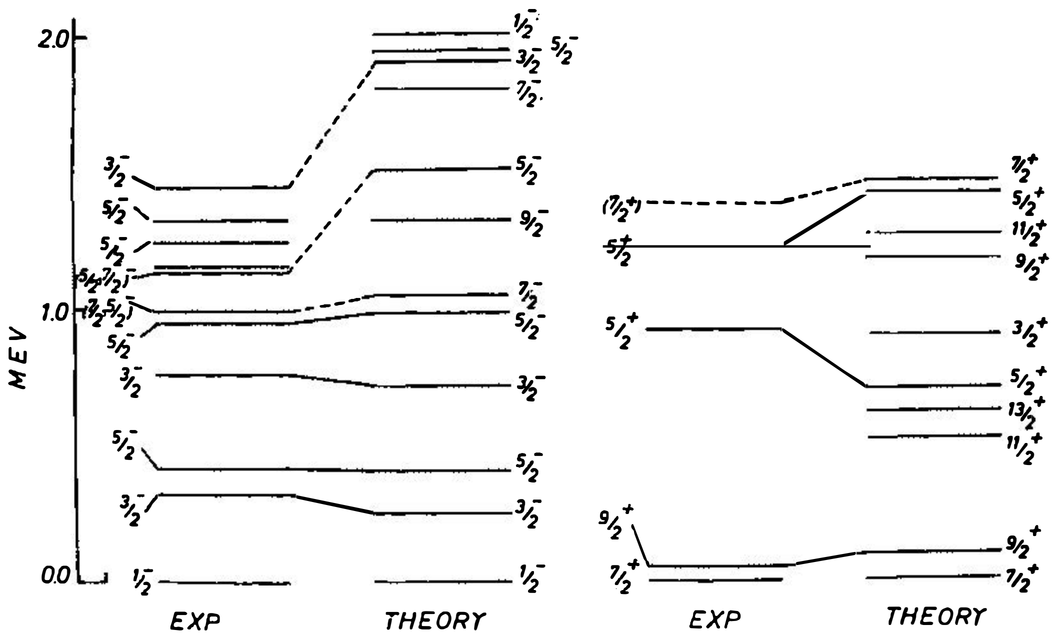

Fig.2. Comparison of experimental and theoretical |3| level structure of ^{107}Ag.

rity states of ^{107}Ag are compared with the corresponding theoretical one as calculated by V. Paar |3| using the three particle cluster coupling to quadrupole vibrations. The model predicts correctly the lowering of the $7/2^+$ over the $9/2^+$ state. It reproduces also very well the position of the two $5/2^+$ levels at 922 and 1223 keV as well as the position of the tentatively introduced $7/2^+$ state.

In general, the negative parity states lying below 1 MeV are reproduced correctly. The agreement with experiment is also remarkably good in the prediction of B(E2), B(M1), mixing ratios and branching ratios of the transitions deexciting these low-lying levels.

Above 1 MeV, however, the agreement between theory and experiment is rather poor. Between 1.1 and 1.3 MeV three excited states are experimentally observed whose spin more likely is $5/2^-$. Theory predicts the lower of these states at 1.5 MeV and the next one at about 1.9 MeV. Identifying the experimental $5/2^-$ state at 1143 keV with the theoretical state at 1.5 MeV the predicted branching ratios do not agree at all with experiment. Another interesting feature is the observed B(E2) values of the two transitions deexciting the 1259 and 1325 keV levels which are remarkably small (1.5×10^{-4} and 3×10^{-4} e^2b^2 respectively). In view of the success of the model in predicting so many properties for the lower lying states in ^{107}Ag it is felt that further theoretical study of this nucleus should be encouraged.

REFERENCES

1 M. Bauvin, Y. Cauchois and Y. Heno, Nucl. Phys. A137 (1969) 520.

2 R.L. Robinson, F.K. Mc Gowan, P.H. Stelson and W.T. Milner, Nucl. Phys. A150 (1970) 225.

3 V. Paar, Nucl. Phys. A211 (1973) 29.