New Classification of Excited States in ^{195}Pt in Terms of the U(6/12) Supersymmetry ◇

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The supersymmetric version of the interacting boson model (IBM) [1–3] allows the simultaneous description of even-even, even-odd and odd-odd nuclei. In this scheme, the U(6/12) supersymmetry describes an even-even and odd-even nucleus in one approach, including the $j = 1/2, 3/2$ and $5/2$ orbits of the odd fermion. The respective analytically derived Hamiltonian in the O(6) limit has the form $H = A\ C_2(U^{B+F}(6))\ +B\ C_2(O^{B+F}(6))$ $+C\ C_2(O^{B+F}(5))+D\ C_2(O^{B+F}(3))\ +E\ C_2(Spin(3))$ with the 5 parameters A,..,E. Using this Hamiltonian, the model has been succesfully applied in the *Pt*- *Au*-region, with ^{194}Pt-^{195}Pt discussed as the best example of the U(6/12) supersymmetry [5]. Mauthofer *et al.* [4] proved that the supersymmetric IBM is able to account for the low lying excited states in the odd-neutron nucleus ^{195}Pt and classified those in terms of the U(6/12) supersymmetry in the range up to $650keV$. Above these energy they provided a few tentative classifications.

We have studied the excitation energy spectrum of ^{195}Pt via (p,d) and polarised $(\vec{d},t)$ high resolution transfer experiments, resulting in an almost complete level scheme up to an energy of $1.3MeV$. 15 states were newly resolved and due to the polarised measurement it was possible to assign 42 levels for the first time.

This achieved level scheme, complemented by a few states taken fron Nuclear Data Sheets, is completely classified in terms of the U(6/12). All (62) states, are included in the supersymmetric classification in the energy range of 0 to $1300keV$. In fig. 1, the correlations up to an energy of $1MeV$ are displayed with the relavant supersymmetry quantum numbers. In the small box on the right, the results for ^{194}Pt are plotted in addition. The correlations between theory and experiment are proven by the detailed level-by-level comparison of experimentally obtained and theoretiocally calculated transfer strengths. In order to provide a more sufficient description of transfer strengths we introduced a semi-microscopically derived transfer operator in the supersymmetric model. Due to the completed and in some cases corrected classifications of ^{195}Pt in respect to the studies of Mauthofer et al., a new significantly changed parametrisation of the U(6/12) Hamiltonian is obtained which yields also new parametrisations of connected supermultiplets in this range of the atomic chart.

References

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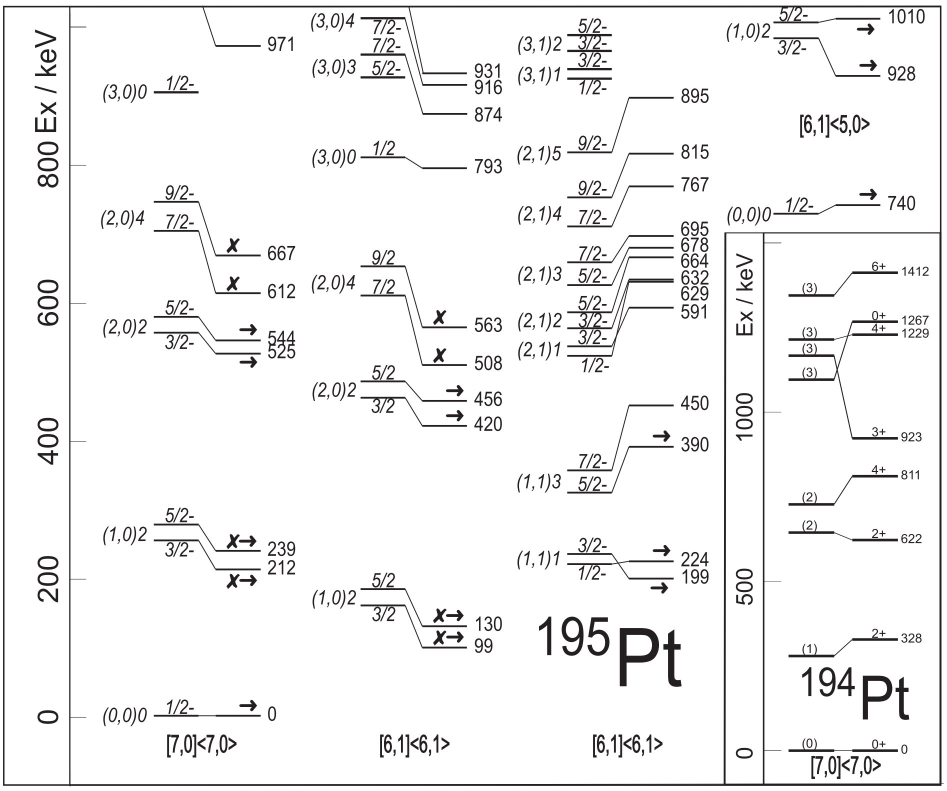

Fig. 1: The classification of ^{195}Pt (negative parity states) and ^{194}Pt in respect to $U(6/12)$ quantum numbers. Predicted levels are shown on the left, the corresponding experimental levels with energies in keV on the right. The quantum numbers (τ_1, τ_2) L are printed to the left of the levels, while $\langle\sigma_1, \sigma_2\rangle$ and $[N_1, N_2]$ are listed below each band. The spin assignments, which are experimentally determined for each state, are printed on top of the theoretical energy levels. Levels which are definitely classified due to the analysis of the transfer strengths and due to $B(E2)$ ratios (taken from Mauthofer et al.) are marked by arrows and crosses, respectively. The remaining states are included in the scheme in respect to their excitation energy and spin resulting in a definite, complete and consistent classification. The results for ^{194}Pt are plotted in the additional box on the right. All known negative party states of ^{195}Pt up to an energy of $1300keV$ are included in this supersymmetric level scheme.

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