Jahn and Tellers last case: the icosahedral sextet, $\Gamma_9 \otimes (g + 2h)$

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The highest degeneracy that a point group can sustain is sixfold and is described by the Γ_9 irreducible spin representation in the icosahedral double group. Jahn identified the corresponding vibronic instability problem as the $\Gamma_9 \otimes (g + 2h)$ case (Jahn, 1938). It is the last and most complicated case of the Jahn-Teller problems.

The linear Jahn-Teller Hamiltonian for this case is described using the appropriate spin-orbit coupling coefficients. [1] The general solution of this Hamiltonian is derived making use of time-reversal symmetry and the equipotential trough regime is identified. The trough has eight degrees of freedom and reflects the symplectic Sp(6) symmetry of the phase space. It is not isomorphic to a rotational symmetry group.
In addition the stationary points of the component problems, $\Gamma_9 \otimes g$ and $\Gamma_9 \otimes h$, are determined. In the latter problem two cases exhibiting SO(3) symmetry are found.
Possible applications of this high-symmetry coupling model are discussed.

[1] P.W. Fowler, A. Ceulemans, *Theor. Chim. Acta* **86**, 315 (1993)