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Cospectrality and the fullerenes

A *fullerene* polyhedron, representing an all-carbon molecule C_n, is cubic, with only pentagonal and hexagonal faces (12 and $n/2-10$, respectively, by Euler's theorem). The spectrum of the adjacency matrix contains a great deal of qualitative chemical information on optimum electron count, electronic configuration, stability and reactivity of the molecule. Connections between graph theory and these chemical models will be discussed. Cospectral fullerene graphs would be of interest as representing molecules with structures that were different but with (some) identical properties. As yet, no cospectral fullerenes are known, but many pairs of fullerenes with cospectral *duals* have now been found (P. W. Fowler and M. Duncan, to be published). The dual of a fullerene graph is also a polyhedral graph, having all faces triangular, 12 vertices of degree 5 and all others of degree 6; considered as the skeleton of a molecule, it is a model for large boron hydrides, based on extrapolation of the known closo-series of borane anions, $B_NH_N^{2-}$. A construction for (infinite) families of cospectral fullerene duals will be presented.