# MOLECULAR EXCITATIONS OF LIGH NUCLEI IN TERMS OF ALGEBRAIC COLLECTIVE MODELS

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Molecular states of light nuclei are special examples of nuclear collectivity. The phenomenological algebraic models[1,2,3] offer a convenient way to treat the collective motions of different multipolarity; so, probably, their applications in relation with this phenomenon may be useful in several respect. Here we report an attempt in this direction.

One of the major applications of phenomenological models is to search for correlations among the experimental data. As for the core+alpha-particle excitations of light nuclei there are some well established molecular bands[4]. Now the question may be asked whether the highly excited states with considerable alpha-width found in recent experiments fit to this picture. In two cases: $^{16}O+\alpha$, and $^{12}C+\alpha$ we have used[5] the accepted molecular bands together with a few more states to deduce the parameters of Hamiltonans corresponding to the U(3) dynamical symmetries of the U(4) and U(6) x U(4) models[2,3] The former one describes the relative motion of two clusters without internal excitation, the latter takes into account the collective excitations of a deformed cluster too. Several new resonances found in alpha-scattering[6,7,8] fit to the model spectra obtained this way.

The resonances appearing in light heavy-ion reactions are also known as examples of molecular excitations. The energy spectrum of the best known such system i.e. $^{12}C+^{12}C$ have been arranged into multiplets by using collective models in References 9,10. The authors applied the O(4) limit of the algebraic dipole model[9], and a geometrical quadrupole model[10], respectively. We have investigated further the questions of multipolarity and the possible existence of a dynamical symmetry[11,12] by means of the algebraic models[2,1]. The parameters of the Hamiltonians have been searched by least square fits; in the first step for each possible dynamical symmetries and in the second step for the two general energy operators. It turned out that no choice can be made between the dipole and quadrupole descriptions, but the present spectrum slightly prefers in both cases the dynamical symmetries corresponding to soft vibrators with spherical equilibrium shape.

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