

# Exact and adiabatic solutions for a spinless Peierls-Hubbard model in a finite cluster

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The exact solution of the Hubbard-Peierls model is given in a cluster of six atoms and three spinless electrons. Phonons with wave vector  $k=\pi/2$  are retained and quantum mechanically analyzed. Energy level and several averages are evaluated, thus determining the physical properties of the model in terms of the parameters of the system. The regime of the distorted lattice is obtained. The exact and Born-Oppenheimer (BO) results are compared, concluding that the BO enhances quantum fluctuations; this peculiar behavior is explained. © 1993 The American Physical Society.