Prof.ssa Liana Martinelli

ATTIVITÀ DI RICERCA

2003-2005

In recent years, orbital physics has attracted the interest of many people due to the interplay between the dynamics of ion and electrons.
The relevance of the interaction between the orbital and lattice degrees of freedom (Jahn-Teller effect) has been already recognized for a long time and has allowed to interpret a variety of physical phenomena both in localized systems (optical properties or possibility to undergo distortions) and in extended systems (relaxation of electronic spins in a lattice, colossal magnetoresistance, high temperature superconductivity).
In the last years, there has been a particular interest in the study of compounds containing localized 4f and 5f electrons, as are lanthanide dioxide PrO_2, actinide dioxides UO_2, NpO_2 and PuO_2. In particular, for PrO_2 and UO_2, a large number of experimental results suggest an unambigous role of Jahn-Teller coupling. In spite of the number of experiments, a microscopic theory that coherently explains all the various observations is still lacking.
In my works, some vibronic models (single-mode and two-mode phonon interaction models, consistent with the symmetry of the system under study) are proposed and analysed [3,4].
Work is in progress to study the interaction among different

Jahn-Teller centers at different sites (cooperative Jahn-Teller effects).

Preliminary results will been presented to the 'International Symposium on the Jahn-Teller effect: novel aspects in orbital physics and vibronic dynamics of molecules and crystals', 28-31 August 2006, ICTP Trieste.

Articoli su riviste internazionali con referee:

1- G. Bevilacqua, L. Martinelli and G. Pastori Parravicini, Renner-Teller interaction matrices and Green's function formalism,
ADVANCES IN QUANTUM CHEMISTRY, vol. 44, pp. 44-57, 2003

2- G. Bevilacqua, L. Martinelli, E.E. Vogel, and O. Mualin,
Jahn-Teller effect in the emission and absorption spectra of ZnS:Cr^2+ and ZnSe: Cr^2+,
PHYSICAL REVIEW B, num. 7, vol. 70, pp. 075206-1-075206-7, 2004

3- G. Bevilacqua, D. Ippolito, and L. Martinelli,
Jahn-Teller effect on PrO2: A multimode vibronic model.,
PHYSICAL REVIEW B, num. 15, vol. 69, pp. 155208-1-155208-6, 2004

4- D. Ippolito, L. Martinelli, and G. Bevilacqua, Dynamical Jahn-Teller effect on UO_2,
PHYSICAL REVIEW B, num. 6, vol. 71, pp. 064419-1-064419-6, 2005

Collaborazioni:

1) Prof. E.E. Vogel, Universidad de la Frontera, Temuco, Cile.

2) Prof. G. Pastori Parravicini, Universita' di Pavia.

3) Dr. Giuseppe Bevilacqua, Universita' di Siena