"Letio Magistralis" CARIPARO: Structure & Function in Minerals

Seminario
Data: Lunedì, 17 Gennaio, 2011 - 16:30 - 17:30
Aula: Aula Arduino
Relatore: Prof. Angel Ross John
Abstract:

The aim of mineralogical research is to understand the relationship between the structure of a mineral and its physical, elastic and thermodynamic properties, so as to develop the same structure-function relationship that underpins the modern structural approach to biology. The principles will be illustrated in this talk by examining recent developments in understanding the structure-function relationships in framework minerals.

Framework minerals are the dominant structure type from the crust to the lower mantle, and include feldspars and perovskites. Their response to pressure and temperature controls the geochemistry of the Earth through changes in cation partitioning and volatile uptake, and the structure and dynamics of the Earth through changes in elasticity. Framework minerals respond to changes in pressure, temperature and extra-framework cations by cooperative tilting of the polyhedra that comprise their structures. The conventional view that the polyhedra are essentially rigid under compression leads to the specific prediction that they should become more tilted with increasing pressure, and that phase transition boundaries will have positive slopes dP/dT. Recent experiments on some perovskites shows that this is not always correct. We have shown instead that the structural response and the form of the phase diagrams of perovskites depends on the balance of bonding forces between the framework and the extra-framework cation. This allows us to predict the evolution of framework minerals with pressure, temperature and composition and will ultimately lead to a structure-based model for their thermodynamic properties.

Afferenza: Visiting Professor, Department of Geosciences, University of Padua
Tipo seminario: Arduino Lecture
Proponente: Prof. Fabrizio Nestola

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