CORDIERITE MONZOGRANITES OF THE HERCYNIAN IBERIAN MASSIF: EXPERIMENTAL INDICATORS FOR A HYBRID ORIGIN.

O. García- Moreno (1), A. Castro (2), L. G. Corretgé (1), K. Klimm (3) and F. Holtz (3)
(olga.garcia@geol.uniovi.es / Fax: +34985103103)

Cordierite-bearing monzogranites form one of the three main groups of granitic rocks in the Hercynian Iberian massif, together with peraluminous leucogranites and biotite granodiorites. The moderate calcium contents (CaO up to 1.21wt%) as well as the low Sr initial isotope ratio of these monzogranite rocks cannot be explained by a pure crustal origin as in the case of the peraluminous leucogranites. The composition of the "most mafic" rock (a cordierite monzogranite) of the Cabeza de Araya pluton (Cáceres, Spain) was chosen to synthesize a glass used in a series of crystallization experiments at different conditions. Phase relations found in these experiments do not reproduce the natural mineral assemblage for the ferromagnesian phases at pressures ranging from 200 to 600 MPa and temperatures from 700 °C to 975 °C, independently on water activity (from water-undersaturated to -saturated conditions with initial H2O in the system: 2wt%, 4wt% and 6wt%). Cordierite failed to crystallize and pyroxenes and hercynitic spinel, which are never found in these rocks in nature, crystallized in our experiments. Oxygen fugacity in the experiments is below the QFM buffer, which may be close to natural conditions of genesis of these granites due to the presence of graphite in the metasediments that may be the crustal protolith. These results are not in agreement with the clearly magmatic features of cordierite crystals in the natural monzogranite. Seeds of natural cordierite crystals (#Mg0= 0,50) were added to the synthetic glass to check for possible nucleation problems of cordierite in the experiments but cordierite was systematically dissolved in the melts at high temperature. Reaction of the cordierite seeds with melt to form plagioclase (up to An60) could
be observed in an experiment (750 °C/ 200 MPa/ initial 4wt% H2O) (Crd + Ca-rich melt -> Pl). Our experimental results can only be explained if we consider that the cordierite monzogranites never were a primary liquid, in agreement with independent observations and hypotheses of other authors. Our results show that it is not possible to nucleate cordierite from relatively calcium rich melts. The bulk composition used in the experiments has to be the result of a process of "mixing" of at least two end-members. The hybrid origin of the magma can be explained in terms of magma mixing of a peraluminous leucogranite with a basic magma, by a process of assimilation of crustal material by mantle-derived magma or, alternatively, by a process of dissolution of mafic microgranular enclaves or dykes by a hydrous leucogranitic magma during decompression.