

Composition and dissolution kinetics of garnierite from Loma de Hierro (Venezuela)

J. CAMA¹, J.M. SOLER¹, W. MELENDEZ², AND A.
RAMIREZ²

¹Institut de Ciències de la Terra “Jaume Almera” (CSIC),
Barcelona, Spain, (jcama@ija.csic.es),
(jsoler@ija.csic.es)

²Universidad Central de Venezuela, Caracas, Venezuela
(wmelende@gea.ciens.ucv.ve),
(aramire@strix.ciens.ucv.ve)

The composition of a garnierite (Mg-Ni silicate) from the Loma de Hierro Ni-laterite deposit (Venezuela) has been determined by means of XRD, TEM and EM (electron microprobe) analyses. This garnierite was collected from a vein in the parent rock of the laterite (serpentinized peridotite).

XRD showed peaks at 7 Å and 10 Å, characteristic of the structures of serpentine and talc, respectively. TEM revealed different areas characterized by either a 7 Å or 10 Å spacing. EM showed a very homogeneous sample composition, with a (Mg+Ni)/Si ratio equal to 0.92. The stoichiometric formula for this garnierite is given by $\text{Mg}_{2.91}\text{Ni}_{0.09}\text{Si}_{3.27}\text{O}_{8.17}(\text{OH})_{2.74}$, which corresponds to a mixture of Ni-containing serpentine (37 mol%) and talc (63 mol%).

Flow-through experiments were performed to measure far-from-equilibrium dissolution rates. At steady state, the stoichiometry of the output solutions did not correspond to the composition of the garnierite. Since these solutions were undersaturated with respect to possible secondary precipitates, the results seem to indicate the different contributions of Ni-containing serpentine and talc to the total rate. The contribution from serpentine to the total rate increases with decreasing pH, in the near-neutral to acidic range.

It is currently planned to collect samples from different depths in order to detect possible trends in the serpentine/talc ratio and its correlation with Ni content. Preliminary reactive transport calculations suggest that the serpentine/talc ratio of the garnierites could decrease with depth, correlating with a decrease in Ni content.