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Geochemical and Microtextural Characterization of Spinels from the Paso del Dragón Complex (NE Uruguay) – Dom Feliciano Belt

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Serpentinites of Cerro La Tuna Lithodeme, occurring within the Ediacaran Paso del Dragón Complex (Dom Feliciano Belt) in the northeastern part of Uruguay, hosts subhedral to anhedral spinel crystals set in both massive and foliated serpentinites. These serpentinites are composed predominantly of serpentine, Ca-amphibole, chlorite, and relicts of pyroxene, along with chromite largely transformed into ferritchromit or Cr-magnetite, and magnetite. These spinels occur disseminated throughout the serpentine matrix or clustered in nodules with amphibole and chlorite, often displaying fracturing, brecciation, and spongy textures indicative of alteration and fluid-rock interaction.

With the aim to establish their nature, trace-element data were obtained by LA-ICP-MS at the Centro de Instrumentación Científica of the University of Granada. These data reveal compositional variations (Li, Ba, Sr, Pb, Cs, REE, among others) that combine evidence of an ultramafic protolith (peridotite/harzburgite) with subsequent metasomatic or hydrothermal overprints. In particular, Cr vs. Ni diagram shows a strong positive correlation, indicating a likely mantle-derived ultramafic origin. However, significant enrichment in mobile elements (e.g., Ba, Sr, Pb) compared to more immobile elements (e.g., Zr, Nb) points to multiple pulses of fluid infiltration. These fluids, likely of different compositions and temperature regimes, triggered partial re-equilibration of spinel compositions, as reflected in spongy or brecciated textures and the pervasive alteration of chromite into Cr-rich magnetite phases.

Integration of geochemical data and petrographic observations suggests that the protolith underwent deformation, serpentinization, and episodic fluid flow. The strong Cr–Ni correlation and pronounced enrichment in mobile elements highlight the influence of hydrothermal and metasomatic processes superimposed on a mantle-derived igneous signature, resulting in the distinctive spinel morphologies and compositional variations previously mentioned.