

## **CHARACTERISATION OF CARBONATED AND SERPENTINISED ULTRAMAFIC BODIES IN SOUTHERN SRI LANKA: IMPLICATIONS FOR MULTI-STAGE GEOLOGICAL EVOLUTION**

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Three serpentinite occurrences in southern Sri Lanka, Ginigalpelessa, Ussangoda, and Indikolapelessa, located along the boundary between the Vijayan and Highland Complexes, have the potential to preserve records of multi-stage fluid-rock interactions, which may be expressed through diverse mineral assemblages and textural relationships at meso- to micro-scales. Field observations prominently revealed crosscutting chert veins at Ginigalpelessa and magnesite networks in all three locations that delineate serpentinitisation processes associated with subsequent carbonation and silicification. Field and petrographic studies, combined with electron probe microanalysis (EPMA) and X-ray diffraction (XRD), were employed to characterised mineral phases and reconstruct the alteration history of these serpentinite bodies. According to XRD analyses, Ginigalpelessa contains both antigorite and chrysotile with minor lizardite, while in Ussangoda and Indikolapelessa, the coexistence of both antigorite and chrysotile polymorphs are accompanied by enhanced goethite, indicative of oxidative weathering. The associated mineral assemblages include talc, brucite, magnetite, forsterite, enstatite, hematite, maghemite, spinel, lizardite, chlorite, and goethite, reflecting progressive alteration of an ultramafic protolith under dynamically evolving fluid regimes. Mesh-textured pseudomorphs after forsteritic olivine ( $\text{Fo}_{9-6-9-8}$ ) preserve primary igneous textures, while disseminated chromium spinel (Cr# 61-86), exhibits holly-leaf morphologies and compositional zoning, indicative of oxidative serpentinitisation. At Indikolapelessa, crosscutting carbonate veins predominantly composed of magnesite, with minor dolomite and quartz, representing post-serpentinitisation carbonation under  $\text{CO}_2$ -rich conditions. The preservation of relict forsterite-enstatite assemblages suggests incomplete serpentinitisation, while the systematic occurrence of magnetite reflects  $\text{Fe}^{2+}$  oxidation during the alteration. Systematic crosscutting relationships between magnesite-rich carbonate veins and serpentinitised zones establish a coherent paragenetic sequence, recording multiple hydrothermal episodes across all the study sites. This integrated, multi-locality analysis elucidates the complex interplay of serpentinitisation, carbonation, and silicification processes, providing critical insight into fluid evolution within ultramafic systems and constraining the timing and nature of multi-stage alteration pathways in Sri Lankan serpentinites.

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