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## Investigating the Role of Country-Rock Assimilation on the Mineralisation of the Platreef, Turfspruit Farm, Northern Bushveld Complex, South Africa

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The Northern Bushveld Complex, South Africa, hosts the world's largest deposit of platinum-group elements (PGEs), known as the Platreef. PGEs are a group of metals essential for autocatalysts, fuel cell technologies, and green hydrogen production. The down-dip extension of the Platreef in the Turfspruit Farm has an indicated mineral resource of 2 g/t of 4PE (Pt + Pd + Rh + Au), 0.16 wt% Cu grade, and 0.34 wt% Ni grade.

The thickness of the individual stratigraphic units on Turfspruit vary, and the relationship between Ni, Cu, and PGE grades is unclear and often decoupled, although correlated on a deposit scale. The thickness of mineralization is also heterogeneous, averaging 14.99m at a 2g/t 4PGE cutoff, but ranging from 2m to 93m. Traditional orthomagmatic ore-forming processes cannot fully explain the distribution of mineralization or its heterogeneous thickness.

The Turfspruit host lithologies intrude and assimilate the reactive sedimentary country rocks of the Transvaal Supergroup. These lithologies vary along strike and include dolomites, shales, banded iron formations (BIFs), and silicate sedimentary rocks. The assimilation of these lithologies formed a complex 'Footwall Assimilation Zone' (FAZ) of varying thickness that underlies the mineralization-bearing units, and consists of, hornfels, calc-silicate, and clinopyroxenites. Where the footwall assimilation was buffered, cyclical norites formed. Previous work has shown sedimentary contamination throughout the mineralized unit, but the relationship between the assimilation of these different country rock lithologies and the thickness and geometallurgy of the overlying mineralization is still poorly understood. Assimilation of reactive sedimentary country rocks, during ore formation, is likely to have released volatiles that may have remobilized PGE mineralization and influenced the grade and thickness of the mineralized units above the FAZ. We will present new petrological, geochemical, and geometallurgical data from a series of drill holes sampled above the various footwall assimilation types to test this hypothesis.