The importance of iron duricrust formation to Brazilian iron ore production.

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Supergene enriched iron ore deposits are typically protected by a goethite-cemented ferruginous duricrust layer referred to as canga [1]. In these deposits, canga forms extensive deposits blanketing ancient erosion surfaces, is tough, moderately hard, well consolidated, permeable and very resistant to erosion and chemical weathering, protecting the relatively soft enriched iron ore below. This protective canga horizon is therefore, essential to supergene iron ore enrichment and formation of high-grade iron ore. Remarkably, the duricrusts in Brazilian tropical rainforest environments yield geochronological results that not only indicate that duricrust formation started in the remote past (> 50-60 Ma), but that they remain active today [2]. Active, biogeochemical iron cycling is essential for the 'self' healing cementation/re-cementation occurring in canga, suggesting that iron reduction and subsequent iron oxidation are responsible for canga formation. Recently, the formation of canga possessing macroscopic 'organic' textures, has been linked to the biogeochemical cycling of iron, which was revealed by the preservation of fossilised cell envelopes and permineralisation of biofilms using secondary, and backscattered electron, field emission scanning electron microscopy. In addition, growth of grasses over several years, forming authigenic iron oxides that consolidate over time suggest that the rhizosphere also contributes to canga formation. At the canga surface, these often unique, endemic plants carve out an existance without 'soil'. The fossilisation of microorganisms and the rhisosphere consolidate canga, affecting permeability, i.e., canga hydrology, limiting water transport and affecting biogeochemical cycling. The formation of canga has been essential for our anthropogenic exploitation of these iron ore deposits, and will ultimately be required for remediation of these unique ecosystems.

[1] Dorr (1964) *Economic Geology* 59, 1203-1240. [2] Monteiro, Vasconcelos, Farley, Spier, Mello (2014) *Geochimica et Cosmochimica Acta* 131, 267-289.