Mineralogy and Potential Applications of Critical and E-tech Metals in the Nkamouna Laterite, S.E. Cameroon.

SULAIMAN MULROY[1*], VICKY COKER[1], JON LLOYD[1], PAUL SCHOFIELD[2].

[1] SEES, University of Manchester, Manchester, UK (*correspondence; dominic.mulroy@manchester.ac.uk)
[2] The Natural History Museum, London, UK

The Nkamouna lateritic deposit in south-east Cameroon hosts enrichments in a number of metals with applications in green technology. Both cobalt and nickel are present in grades exceeding >2wt% in certain localities, values far in excess of typical lateritic values of ~1wt% and ~0.1wt% for Ni and Co respectively[1]. Enrichments in REEs (Ce, Nd, Pr) are also present with cerium being the most abundant with a concentration range of 0.05-0.35wt%. Both Co and Ni are integral components of rechargeable batteries for electric cars and have numerous applications as catalysts in the petrochemical industry[2]. Additionally, both Co and REEs are used in high-performance magnets for cars and wind-powered energy generation[3]. K-edge EXAFS has been used to produce crystallographic site models for Ni and Co within the host ore while for Ce L_3-edge XANES has been used to understand possible locations for REEs. All three are associated primarily with Mn(IV/III)-oxides such as lithiophorite and cryptomelane-hollandite type phases. The bulk of the laterite is dominated by Fe(III)-oxides and oxyhydroxides (goethite and hematite) producing a prodigious amount of Fe-rich waste for which a use is potentially found through the generation of biogenic magnetic nanoparticles. Using dissimilatory metal reducing bacteria and doping suspensions of Fe(III)-oxyhydroxides with various metals (e.g. Ni and/or Co) bioreduction can be utilised to generate magnetite with tailored properties[4] making them ideal for use in a range of applications, including remediation[5] and catalysis[6][7][8].

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