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The application of CCSEM to heavy mineral beach sands: a provenance analysis around the coast of Sri Lanka

N. Keulen (1), S. Bernstein (1,2), D. Frei (1), C. Knudsen (1), A. Gunatilaka (3) R. McLimans (4)

(1) GEUS, Øster Voldgade 10, 1350 Copenhagen K, Denmark, (2) Avannaa Resources Ltd., Geological Museum, Øster Voldgade 5-7, 1350 Copenhagen K, Denmark, (3) 10, Thumbovila, Piliyandala, Sri Lanka (4) E.I. DuPont de Nemours, DuPont Titanium Technologies, Wilmington, DE 19880, USA (ntk@geus.dk)

Beach sands are one of the precursors of sandstones. Beaches lie at the transitions between the hinterland of the sediment and their marine depositional site. Especially in (sub)-tropical environments, beaches are high energy environments where sediment ripening and geochemical processes, like e.g. leaching, can take place. Therefore, an investigation of the beach sand heavy minerals provides a provenance analysis as well as a tool for mineralogical investigation. A good understanding of processes acting on beaches might help in reservoir rock studies.

Approximately one hundred beach and river samples covering a large part of the Sri Lankan coast and its hinterland were analysed with computer controlled scanning electron microscopy (CCSEM). This technique can be applied to sand samples, crushed rock material and to heavy minerals in thin sections. CCSEM combines the advantages of energy dispersive X-ray spectrometry with those of digital image analysis on back scatter electron contrast micrographs. CCSEM analysis is an efficient method to measure both the chemistry of individual grains and of the bulk sample of geological or non-geological materials (Bernstein et al., 2008). The chemical analysis is combined with the measurement of the size and morphology of every single grain. CCSEM provides a rapid method to measure hundreds or thousands of grains per sample.

The heavy minerals of the beach sands of Sri Lanka can be divided into six groups, which differ in their heavy mineral assemblage, and in their garnet and ilmenite composition. These groups can be linked to the different hinterlands of the rocks, khondalites, charnockites, amphibolite facies rocks and Mesozoic sediments. Varying portions of the ilmenite grains are enriched in TiO2.

Ref.: Bernstein et al., 2008, J. Geochem. Expl., 96(1):25-42.