Geological representivity of returned drill cuttings from coiled-tubing drilling in a hard rock environment.

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GEOLOGICAL REPRESENTIVITY OF RETURNED DRILL CUTTINGS FROM COILED-TUBING DRILLING IN A HARD ROCK ENVIRONMENT.

GEOLOGICAL REPRESENTIVITY OF CUTTINGS

ABSTRACT

With the global discovery rate of mineral deposits decreasing and with near surface resources being gradually depleted, there is a need for new technologies to aid in the discovery of mineral deposits under deep cover. In order to increase the productivity of deep exploration, the Deep Exploration Technologies Cooperative Research Centre (DET CRC) is building a Coiled-tubing (CT) drill rig, which is accompanied by a top-of-hole Lab-at-Rig® system, allowing real time geochemical and mineralogical analysis. Rather than produce core, CT drilling returns cuttings to the surface within the drilling fluid. These cuttings are passed through a Solids Removal Unit (SRU) which separates cuttings from the drilling fluid, from which they can be prepared for analysis. Drill cuttings from the CT rig can have broad and heterogeneous particle size distributions (PSD). Enroute to the surface, these drill cuttings can be subjected to differential rate of return and mixing of particles from adjacent depths, which can cause smearing in the geochemical signal. A series of experiments were conducted at 100 m depth through simple, single-layered pseudostratigraphies using full-faced diamond and Wassara hammer drill bits, in order to quantify this smearing effect, and provide advice on how to mitigate against it. Samples were taken before and after the SRU, to assess the contributions of up-hole flow and the SRU to smearing. Pre-SRU samples were found to have consistently decreased smearing compared to post-SRU samples. The results indicate that limited smearing is occurring during up-hole flow, likely due to efficient cutting transport at the high flow rates (120-150 L/min) associated with CT drilling. Smearing within the SRU is most likely the result of particle separation and settling rates in the shaker tank. This smearing can be mitigated by simple modification in the design of the SRU, notably by reducing the water column.

KEYWORDS:

Geochemistry; coiled-tubing drilling; Solids Removal Unit (SRU); annulus; mineral exploration; pXRF; particle size distribution (PSD); depth fidelity

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