

Go Small or Go Home... The Evolution of Using the Ultrafine Soil Fraction for Mineral Exploration

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Ongoing discovery success requires innovation especially in sample collection and analysis. Soils are widely used as a geochemical sample medium and whilst large geochemical surveys conducted by mining companies are common, the suite of data we collect beyond standard soil chemistry has remained stagnant. In addition, the soils that host/adsorb the mobile element signature are the smallest size fractions, especially in transported cover, so we should consider concentrating the clay size fraction (<2 µm) as an improved sample medium. An innovative, new integration of analytical methods known as UltraFine+® extracts the “standard soil chemistry” of the <2 µm soil clay fraction, which is combined with soil spectral mineralogy proxies and physicochemical properties to improve interpretation of soil chemistry. Following the refinement of the technique, we commercialised and then applied the new UltraFine+® workflow to numerous orientation site studies, including reprocessed archived regional soil samples. A series of experimental research was conducted to demonstrate the value of using <2 µm fractions for exploration geochemistry to give industry confidence in the benefit of this technique including testing that international quarantine treatment procedures would not impinge upon results for soils collected outside Australia and the addition of REE, Br and Pd (that were not initially considered). Thousands of soils have now been tested in the vicinity of known mineral deposits (including background areas). Analysing fine fractions (<2 µm) generates reproducible, reliable results, with greater concentrations compared to standard techniques. Key benefits are the removal of nugget effects (for Au) and a marked decrease in censored results for Au, less variation with sampling depth in soil profiles, and value from (re-) assaying regional soil samples to generate new targets. To date the new process has been applied on all continents (except Antarctica) and is expected to become an industry standard in the future.