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Effect of grain size on phase identification in fine-grained samples: Optimisation of TIMA (Tescan Integrated Mineral Analyser) analyses

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Accurate mineral identification and quantification are fundamental steps in addressing many geological problems. Scanning electron microscope based automated mineralogy techniques, such as TIMA (Tescan Integrated Mineral Analyser) can provide this information, However, the suitability of the data is dependent on the nature of the sample and the analytical conditions used. This work aims to assist in the optimisation of analytical conditions required to minimise problems such as false phase identification and elemental interference observed during chemical composition analyses of fine-grained materials. The case study is from a gold mineralisation area and the fine-grained intermediate volcanics-volcaniclastics host rocks at the Mulga Bill in Meekatharra, Western Australia. TIMA mapping reveals the chemical analysis of a mineral can be influenced by neighbouring phases and is dependent on the grain size or, mineral inclusions. The elemental interference from neighbouring mineral phases can be observed in the X-ray spectra of the target mineral, and these effects often dominate fine-grained material. For example, a pronounced elevated false sodic content is observed in fine-grained micas neighbouring albite. On the contrary, the chemical compositions obtained from coarse-grained phases through TIMA are in close agreement with SEM-EDS spot analyses. This highlights the importance of understanding the sample properties, particularly the grain size and the use of appropriate analytical conditions to provide the required information. This results in accurate, reliable and comparable data.