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# Methodical aspects in heavy mineral identification by Raman spectroscopy and optical microscopy

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Fundamental information on sedimentary provenance is provided by quantification of heavy mineral assemblages from sand-sized sediment. Heavy mineral identification by optical microscopy is a classical technique frequently used in sedimentary provenance analysis, but the successful identification relies on the operator's experience (operator bias) and even with sufficient experience, discrimination can be difficult (e.g. colorless and/or rounded grains) or impossible (e.g. opaque grains). Raman spectroscopy can be used for mineral identification and has already been incorporated in heavy mineral studies. However, standard sample preparation of heavy mineral slides for optical identification includes cover slips and an embedding medium, which impedes further chemical or mineralogical analysis of the embedded grains by e.g. electron microprobe, LA-ICPMS, Raman or infrared spectroscopy.
The aim of this study is two-fold. (1) We present a preparation approach which allows all the above mentioned methods to be carried out on the same specimen and hence, enables multi-analysis of the mounted mineral grains. (2) We use the new preparation approach to compare optical with Raman spectroscopic identification of heavy minerals to elaborate on potential advantages and pitfalls of either method. First results suggest that easily recognizable minerals like zircon or garnet are over represented in optical evaluation while darker colored grains like rutile are over represented in Raman evaluation. Several case studies from Triassic and Tertiary siliclastics as well as modern sediment will be presented to further evaluate systematic contrasts between optical and Raman determination of heavy minerals. Given that Raman spectroscopy provides a fast and relatively easily applicable method of mineral identification, a careful comparison with optical techniques seems necessary before it may become a routine application in heavy mineral analysis.