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Contamination acquired during routine grinding of geologic samples

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Contamination levels for a wide spectrum of elements were examined, acquired during routine grinding of geologic samples. Quartz crystals were the starting material, because of its rather simple composition and hardness (hence, easier ways to detect contamination, stronger interactions with grinding surfaces).

Powder samples (less than 200 mesh) were obtained following routines: number 1 initiated with crushing of crystals to manageable sizes by Fe-Mn steel jaw crusher, quartered and powdered by a Fritsch agate planetary mill. Another batch was prepared using a WC secondary crusher, and then finally powdered with the same agate mill. A third batch, also powdered with the agate mill, was crushed with a hydraulic press with Carbon steel plates. A second routine repeated the above described procedures, substituting the agate mill by a WC planetary Fritsch mill. The third routine followed the same procedures outlined, using now for the final powdering a Fritsch Cr-Fe steel planetary mill. Nine different powdered samples were thus obtained, prepared for analysis by conventional methods (solutions) and analysed preliminarily by semiquantitative ICP-MS procedures (TotalQuant, in triplicate). Those elements which showed significant contamination were further analysed either with ICP-MS or ICP-OES standard methods, while those that showed no response (intensities below, or close to, detection levels, such as all REE) were disregarded. Results show, not surprisingly, significant contamination with Cr-Fe routine: Fe (2400-3400), Cr (380-320), Cu (7-8), Ni (7-4), and V (1.6 to 2.1, all ppm), and with the WC routine: Co (82 to 75), W (950-1000), Mo (2-4) Ta (around 2.5) and Nb (around 0.7, all ppm). Contamination with agate grinding was in general negligible.

These studies were extended to determine cross contamination effects, first grinding a reference sample of basalt, followed by routine cleaning, and finally grinding of quartz, as depicted above (a similar procedure was used for cross contamination studies with a reference granite). Cross contamination effects on quartz were found negligible both for basalt and granite, except the ones already identified during primary contamination, as described in the cited routines.

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