Crystallographic effect on atom probe tomography geochemical data

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The recent application of atom probe tomography (APT) to geological materials is becoming a powerful tool to unravel many unaswered questions in different research areas such as geochronology, environmnetal mineralogy, paleoclimatology and the formation of planetary bodies. Despite recent advances on the APT development, there are still fundamental aspects that are insufficiently constrained. Among these aspects, the influence of crystallography on the quality of mineral chemistry has not been properly evaluated. The interpretation of the complex mass spectra from natural geological samples could be problematic if samples from the same material exhibit different 'geochemical behavior' when choosing different crystallographic planes for sample preparation. In order to evaluate the APT performance on determining the bulk atomic composition of minerals and shed light on the effect of the crystallography on geochemical data, we performed a set of analyses on different crystallographic planes of mineral standards representing different crystal systems: barite (orthorombic), quartz (trigonal), and galena (cubic). Initial results for barite do not show a fundamentl difference between chemical datasets obtained from different crystallographic planes, whereas data for galena and quartz are still under evaluation. Overall, this study is part of the wider investigation for the optimazation of APT for geological applications.

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