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Chromites: geochemical insights provided by statistics. A case study

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Abstract

The present study aims to identify the extent to which the statistical approach can provide insights into the geochemical properties of chromite. For this purpose, chemical analyses referring to metasomatic chromites, chromites hosted by arc-related ophiolites, and chromites associated with Precambrian ophiolitic mafic-ultramafic bodies were considered. The results of the statistical approach showed that Principal Component Analysis and Pearson correlation coefficients can help identify the geochemical properties that individualize the three types of chromites. Also, the strong negative correlations noticed between Mg and Fe^{2+}, Cr and Al, (Mg + Cr) and (Fe^{2+}+Al), and (Mg+Al) and (Fe^{2+}+Cr) indicate the geochemical changes that may occur during chromite crystallization, regardless of their geological setting. They reveal the nature of either metasomatic substitutions (regarding metasomatic chromites) or changes in the chemistry of the crystallization environment (when chromites are related to ophiolites). Similar processes, but involving different geochemical changes, take place at the scale of each occurrence. That is supported by the strong negative correlations between Cr and (Mg+Al), Al and (Mg+Cr), Cr and (Fe^{2+}+Al), as well as Al and (Fe^{2+}+Cr), identified especially in metasomatic chromites and those hosted by arc-related ophiolites. The interdependency between the degree of occupancy of the R1 and R2 structural sites is more pronounced in the metasomatic chromites.

Keywords: chromite, univariate statistics, bivariate statistics, Principal Component Analysis, Pearson correlation matrix.

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