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Geochemistry of trace elements in high purity bentonites.

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Bentonites are rocks mainly composed of smectites, which are phyllosilicates with a 2:1 structure: one octahedral sheet between two tetrahedral sheets. The tetrahedral sheets are composed of silica tetrahedrons and the octahedral sheet is composed of octahedrons of cations like Ti^{4+}, Al^{3+}, Fe^{3+}, Fe^{2+} or Mg^{2+} in variable proportions. The isomorphic substitutions of cation that can occur in both sheets give a layer charge that is compensated with the presence of hydrated cations such as Ca^{2+}, Na^{+}, K^{+} or Mg^{2+}. These chemical elements are the major constituents of the smectites, but other trace elements such as Rare Earth Elements (Light-group Rare Earth Element and Heavy-group Rare Earth Element) are included in a very small amount in the structure of the smectites. The aim of this work is to study the geochemistry of the trace elements in high purity bentonites. For that purpose, the samples included in this work were selected from two different sources. On the one hand, a systematic literature search was conducted in order to look for articles that studied bentonitic samples that met two criteria: a) the samples had more than 85% of smectites and b) the samples had chemical analyses data of trace elements. On the other hand, the chemical composition of a wide group of samples was studied. Samples were categorised according to their origin (hydrothermal or sedimentary), their nature (dioctahedral or trioctahedral) and the data were analysed statistically using SPSS software comparing the proportion of trace elements of the samples by the categories. According to the results, the samples show clear differences between dioctahedral and trioctahedral nature. In general, the dioctahedral samples have higher concentrations of trace elements than trioctahedral samples. The samples categorised by their origin also show differences. Specifically, the samples with a hydrothermal origin have higher concentrations of trace elements than the samples with a sedimentary origin. This tendency was observed for both data from the literature and from the samples here studied.

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