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The influence of ferric/ferrous iron ratios in bulk and mineral chemistry on calculation of metamorphic conditions: Application to the N-Makran blueschists, SE Iran

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Blueschists provide key information on subduction thermo-mechanical processes. In particular, numerical models and thermobarometric recalculations are used to infer burial depth and exhumation pressure-temperature paths. Most of the current thermodynamic solution models of minerals stable in high pressure/low temperature systems, such as sodic amphiboles and lawsonite, assume ferric/ferrous iron ratios based on charge balance calculations. The actual values are poorly known, although they seem to have an important influence on mineral stability fields. Since the metamorphic blueschist facies is defined by the occurrence of sodic amphiboles, it is crucial to understand the conditions required to crystallize these minerals. Colorimetric titration was used for ferric/ferrous iron ratios in bulk compositions, Moessbauer spectroscopy in mineral standards, TEM (EELS) and micro-XAS for the application on amphiboles formed at different pressure and temperature conditions.
Implementing measured instead of modeled iron values in the bulk composition has a significant effect on pressure/temperature recalculations.

First results on the micro-XAS measurements are compared to the other techniques. The consequences for pressure-temperature conditions of the Makran and other blueschists under investigation will be discussed.