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Mineralogical and ore-petrographic comparative investigation of iron ores from West-Crete, Greece

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Considerable iron ore occurrences are located in Crete and particularly in the western part of the island. In this paper a comparative study, based on mineralogical analysis results and ore-microscopy examination of iron ore samples originated from different places of western Crete, was carried out. The examined samples come from Skines and Drakona area (prefecture of Chania), as well as, from Arolithi and Ano Valsamonero area (prefecture of Rethymno). The iron ore occurrences are placed within the Phyllite-Quartzite-Series (PQS), a high pressure/low temperature metamorphic subunit of the Phyllite-Nappe of Crete. The Phyllite-Nappe is a structural unit of the External Hellenides lying in between the Plattenkalk-Series underneath and the Tripolitza-Series above. The PQS consists mainly of phyllites and quartzites and secondarily of metaconglomerates, marbles, calcareous phyllites and metabasalts [1].
The mineralogical composition and the fabric of the iron ores samples were investigated using the X-ray diffraction analysis and ore-microscopy. The chemical composition of bulk samples were determined by X-ray fluorescence technique, while the microanalyses were performed by SEM-EDS.
The iron ores occur in the form of lenses in the area of Skines, Arolithi and Ano Valsamonero, while in the area of Drakona in the form of bed vein within the phyllite and quartzite of the PQS. The determined major minerals of the iron ores are: goethite, hematite and quartz. Chlorite, muscovite, paragonite are minor minerals, while talc, pyrite, graphite, gibbsite, lepidocrocite, such as Mn-minerals cryptomelane and pyrolusite, are rare. The ferruginisation in Skines, Drakona and Arolithi occurrences developed mainly in the form of goethite and secondarily in form of hematite and lepidocrocite by replacing gradually the binder between the grains of strongly fragmented and brecciated phyllite and quartzite. Goethite forms sparingly concentric shells along breaks and alter to hematite due to dehydration. On the contrary, the iron-rich solutions in the occurrence of Ano Valsamonero have been precipitated in the form of hematite. Often, hematite appears as radial aggregates in the shear zones of the host rocks, replacing progressively the matrix. The ferruginisation is accompanied occasionally by the presence of Mn-minerals. In the iron ore samples from Drakona and Arolithi cryptomelane is observed, while in those from Ano Valsamonero pyrolusite [2]. Pseudomorphic crystals of goethite to pyrite were determined in iron ore samples from Skines and Arolithi. The concentration of iron oxide in ore samples exhibits significant fluctuations.
The ore-microscopy examination of the collected iron ore samples indicated that iron-rich solutions caused the massive replacing ferruginisation (epigenetic processes) in the native rocks of phyllites and quartzites. The presence of a limited extent sulphide mineralization in the area of Skines, Arolithi and Ano Valsamonero, could be related to the formation of the iron ores.

References

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