An ore textural approach to evolution of mineralising processes: the case of a classic Fe-(Cu) skarn deposit at Ocna de Fier, Banat, Romania.

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Textures and relationships among refractory minerals (magnetite, garnet, pyrite) provide evidence for the specific crystallisation history at Ocna de Fier, a classic zoned skarn deposit. Metal zonation is centred above the fluid source in the deepest Fe-Cu part of the deposit, characterised by Mg-skarn and enveloped by Fe- and Zn-Pb-(Cu)-zones in calcic garnet-pyroxene skarns. Both magnetite and hematite are formed during prograde skarnification; the two minerals respectively prevailing in cores and envelopes of individual orebodies in the Fe-zone. Carbonate-quartz piercing and cracking, blown-apart textures and shock-induced garnet anisotropy evidence the interruption of prograde skarnification by volatile build-up. Explosive boiling, dissipated by fluid-pumping and milling, resulted in repeated collapse within the 5 km deep system, and marked the start of retrograde events. Prograde assemblages were overprinted by hydraulic reworking, resulting in brecciation and deformation textures (microtextural adjustments, abrasion, overgrowth during microshear-assisted fracture, jigsaw borders, syn-deformational hooks and pressure shadows). Subsequent annealing and healing is seen in equilibration reactions and recementation along grain boundaries and welding of fragments. Despite recrystallisation, such features are recognisable in the reworked envelope of orebodies within the Fe-zone and are mirrored by magnetite replacing hematite. Reversion to magnetite stability is induced by a dramatic drop in fO_2, due to boiling. Distal, Zn-Pb-(Cu) parts of the deposit formed during prolonged retrograde outward-directed mineralisation. Analysis of microtextures at Ocna de Fier show parallels to hydrothermal breccia and regionally metamorphosed deposits and represent a useful key to zoning patterns during deposit evolution.