The Origin and Emplacement of Fluorite Orebodies by Replacement of Pegmatitic Carbonatite, Sodic Fenite, Marble, and Biotite Schist at Okorusu, Namibia

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The alkaline igneous-carbonatite complex at Okorusu, Nambia consists predominately of nepheline syenite, foyaite, poorly exposed fine-grained (about 1 μm) carbonatite, and tinguaite dikes. Fluorite orebodies are contained dominantly in sodic fenites extensively developed along the southern flank of the complex.

Recent open pit mining at the A and B orebodies has revealed pods, dikes, and veinlets of pegmatitic carbonatite representing a late phase of volatile-rich carbonatite magma injected into brecciated sodic fenites. It consists of very coarse-grained (13 cm) calcite, magnetite, apatite, and platy pyrrhotite-pyrite. Titaniferous magnetite and ilmenite crystals were deposited at the margins of the pegmatitic carbonatite intrusions, and typically have grown inward from the fenite wall. Silicocarbonatites have formed at the contacts between pegmatitic carbonatite and sodic fenite.

Recent mapping at Okorusu has shown that much of the fluorite ore has formed by the replacement of pegmatitic carbonatite. Replacement remnants consisting of titaniferous magnetite rims, goethite pseudomorphs after magnetite, aegirine-augite, and pyrrhotite-pyrite crystals, and local unreplaced remnants of pegmatitic attest to that replacement process.

The fluorite ores also have replaced pegmatitic carbonatite-cemented sodic fenite breccias, and fenitized marbles and biotite schists. Ores formed by replacement of marbles and schists are characterized by faint to distinct banded ore textures.