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Akimotoite, (Mg,Fe)SiO₃, a new silicate mineral of the ilmenite group in the Tenham chondrite

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ABSTRACT

Akimotoite, (Mg,Fe)SiO₃, a new silicate mineral of the ilmenite group, was found in the shock-metamorphosed Tenham chondrite. It occurs as aggregates adjacent to clinoenstatite in fragments within shock-induced melt veins. Chemical analyses show the simplified formula to be (Mg_{0.79}Fe_{0.21})SiO₃, the same as for clinoenstatite. Selected-area electron diffraction (SAED) patterns correspond to the synthetic (Mg,Fe)SiO₃ ilmenite phase with space group $R\bar{3}$. Lattice parameters derived from SAED patterns are $a = 0.478(5)$ nm, $c = 1.36(1)$ nm and $V = 0.269(8)$ nm³ in the hexagonal setting. The calculated density is 4.0(1) g/cm³. Akimotoite in this occurrence is thought to have been transformed from original orthoenstatite in a solid-state reaction produced by a shock event. Peak pressure and temperature generated by shock events in Tenham are estimated to be 22 GPa $< P_{\max}$ < 26 GPa and $T_{\max} > 2000$ °C, assuming that equilibrium crystallization of aluminous majorite occurred in the melt veins. This new mineral was named after Syun-iti Akimoto.