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ZAOYANG CHONDRITE COOLING HISTORY FROM PYROXENE Fe^{2+}-Mg INTRACRYSTALLINE ORDERING AND EXOLUTIONS; G.M. Molin, Dipartimento di Mineralogia e Petrologia, Università di Padova, Italy; M. Tribaudino, Dipartimento di Scienze Mineralogiche e Petrologiche, Università di Torino Italy and E. Brizi, Dipartimento di Scienze della Terra, Università di Perugia, Italy.

The Zaoyang ordinary chondrite fell as a single 14.15-kg mass in Hubey province (China) in October 1984 and was classified as a non-brecciated H5 chondrite, shock facies b [4]. Cooling rate in pyroxenes can be calculated down to about 1000°C by using fine textures and at still lower temperatures (700 to 200 °C) by intracrystalline ordering processes [1] [2] [3]. The crystal chemistry of clinopyroxene and orthopyroxene from the matrix of the H5 Zaoyang chondrite has been investigated by X-ray structure refinement and detailed microprobe analysis. By comparison with terrestrial pyroxenes cell and polyhedral volumes in clino- and orthopyroxenes show a low crystallization pressure. Fe^{2+} and Mg are rather disordered in M1 and M2 sites of clino- and orthopyroxenes; the closure temperatures of the exchange reaction are 600 and 512°C respectively, which is consistent with a quite fast cooling rate, estimated of the order of one degree per day. The closure temperature for the intercrystalline Ca-Mg exchange reaction for clino- and orthopyroxenes is 900°C, as calculated from a matrix orthopyroxene showing clinopyroxene lamellae about 10μ thick. Kinetic evaluations based on the thickness of exolved lamellae give a cooling rate of not more than a few degrees per 10^4 years.

The different cooling rates obtained from Fe^{2+}-Mg intracrystalline partitioning and exolution lamellae suggest an initial episode of slow cooling at 900°C, followed by faster cooling at temperatures of 600-500°C at low pressure conditions. The most probable scenario of the meteorite history seems that the exolved orthopyroxene entered the parental chondrite body after exolution had taken place at high temperature. Subsequent fast cooling occurred at low temperature after the formation of the body.

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