# Multistage melting in the lower crust: an example from the Proterozoic Eastern Ghats Belt, India

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Rocks of the Eastern Ghats Belt (EGB) experienced ultra high temperature (UHT) metamorphism and post-UHT thermal relaxation. Textural, phase equilibria and in-situ geochronological data from this belt show episodic melting history of the lower crust.

We characterize two-stage melting processes in lower crust. While the leucosomes layers of migmatitic aluminous granulite preserves the textural evidences for an early melting event ($M_{1L}$), the fine symplectic intergrowth involving cordierite, K-feldspar, quartz, plagioclase with minor orthopyroxene, biotite and sillimanite in the same leucosome layers bears the imprint of a later melting event ($M_{2L}$). $M_{1L}$ melt was produced by incongruent melting of Ti-F biotite and was mostly lost from the lower crust to preserve the UHT assemblage. An early UHT metamorphism (1011±10 Ma) was associated with this melting which was followed by isobaric cooling. The traces of biotite that formed during the cooling stage as a consequence of $H_2O$-F fluid intake during back reaction of $M_{1L}$ melt caused renewed fertility of the crust. The granulite-grade reworking at 953±6 Ma caused $M_{2L}$ melting and the melt crystallized at 939±6 Ma. Although the melting was initiated as a $H_2O$-understaurated process, it shifted to $CO_2$-$H_2O$ present one during the exhumation at shallower level. This study explains how an infertile cooled crust rehydrates and undergoes melting with production of complex texture.