Evidence of diffusion driven coronae formation during Pan-African Orogeny in dolerite dykes from Southern Granulite Terrain (SGT)

M BANERJEE[1] A BANERJEE[1] B K SOLANKI[1]

U DUTTA[1] U BHUI [2] R ANAND[1]

P SENGUPTA[3] D MUKHOPADHYAY[4] Z D ATLAS[5]

[1]Department of Applied Geology, IIT(ISM), Dhanbad 826004, India (meenakshi.rnj@gmail.com)
[2]School of Petroleum Technology, PDPU, Gandhinagar Gujarat 382007, India (ukbhui@gmail.com)
[3]Department of Geological Sciences, Jadavpur University, Kolkata 700032, India (pulaksg@gmail.com)
[4] Raman Centre for Applied and Interdisciplinary Sciences, Kolkata 700075, India (dhruba_38@yahoo.co.uk)
[5]School of Geosciences, University of South Florida, Tampa, Florida 33620(zatlas@usf.edu)

A suite of Neoproterozoic dolerite dykes from SGT shows replacement of magmatic phases by metamorphic minerals. Two types of dykes,Olivine (Ol)-absent and Ol-bearing, have been identified. Both the types contain clinopyroxene (Cpx), plagioclase (Pl) and Fe-Ti-oxides as primary igneous phases. In the Ol-absent dyke, Cpx and Pl are separated by garnet (Grt)-quartz (Qtz) coronae.In places where Grt is absent, Amphibole(Am)-Qtz form the coronae.The Al-containing product Grt/Am always forms on Pl, whereas Qtz forms near Cpx.This reflects relative immobility of Al, implying diffusion as the process for coronae formation. In Ol-bearing dykes, Ol and Pl are replaced by two layers of coronae. Near Ol, corona of orthopyroxene (Opx) forms containing a thin layer of magnetite (Mag) within it.The corona displays constant thickness and mimics the Ol shape. Proximal to Pl, Am layer replaces both Pl and Opx in the corona. Interestingly, Opx is optically continuous across Mag layer. This can be due to breakdown of Ol to more magnesian Opx making the system Fe-rich and promoting Mag formation which in turn makes the system Mg-rich and Opx continues to form. Optical continuity of Opx through Mag layer, uniform thickness of corona along with preferential growth of aluminous phase near Pl, suggest that diffusion was the dominant process for coronae formation. Opx formed during peak metamorphism (~800-850°C, 6.5-7.5 kbar) and Grt/Am formed at lower temperature (650-750°C). This range supports earlier reports of Pan-African metamorphism from this area. The source of the fluids can be due to the granitoid intrusion during this tectonothermal event.