Petrology And Geochemistry Of Pyroxene Granulite Of Somvarpet, South Western Dharwar Craton, Karnataka, India

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The Somvarpet area forms a part of high grade granulite terrain in the Western Dharwar Craton. The area mainly consists of peninsular gneiss, Charnokites, pyroxene granulites and mafic enclaves. The Pyroxene granulite, which forms one of the major lithological unit, occurs as large parallel bands with in the peninsular gneiss and exhibit metamorphic textures (Granoblastic and porphyroblastic textures), which are often superimposed on relict mafic igneous textures (ophitic, sub-ophitic and intergrowth textures). Mineralogically, the rock essentially contains Ortho and Clino Pyroxenes, and Plagioclase. Quartz, Garnet and Hornblende occur as accessory minerals, whereas, Illmanite, Rutile, Apatite, Spene and Iron oxides are the minor minerals.

Geochemically, the Pyroxene granulites show tholeiitic affinity with iron enrichment, which is a characteristic feature of Archean tholeiites. Variation in trace element concentrations, particularly, Rb, Th, U and Pb, would indicate their instability during metamorphism. To understand the tectonic setting of pyroxene granulites, the analysis were plotted on various known discriminate diagram, the plots fall well within the basaltic and Island arc tholeiitic fields. The average concentration of Rb (6.60ppm) of pyroxene granulite of Somavarpet is very low compared to the Archean tholeiites (12ppm), probably, due to the loss of Rb during granulite facies metamorphism and it is substantiated by the plot of K Vs Rb, where, the pyroxene granulites follow depleted granulite trend. The Pyroxene granulites of the area exhibit slightly fractionated REE patterns, mainly due to, LREE enrichment rather than the HREE depletion.

Redox-sensitive metals and their isotopes: The Holland legacy of early ocean exploration

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“How lucky I am to have something that makes saying goodbye so hard.” – A. A. Milne

In 1984 [1], Dick Holland noted the striking correlation between the abundances of Mo and U on the one hand, and organic carbon on the other, in Devonian black shales. He speculated that the slope of this correlation should scale with the abundances of these elements in ancient oceans, which in turn should scale with environmental redox conditions. These few paragraphs gave rise to a new theme in deep time paleoredox research – trace metals as paleoredox proxies – much of it centered on the question that dominated Dick's interest in his later years: how and when did the Precambrian atmosphere and oceans become rich in O_2?

Over the following ~30 years, and particularly in the last decade, analytical advances turned this speculative vision into a rich and mature field. The development of ICP-MS paved the way for the assembly of large datasets of Mo and U abundances in sedimentary rocks through time. The coupling of multiple dectector arrays to ICP-MS instruments opened the door to exploration of variations in the isotope abundances of these and other redox-sensitive elements, revealing a new and unexpected dimension of paleoenvironmental information.

We will assess the future of this field in light of insights it has yielded. For example, there is now broad confirmation of a Paleoproterozoic "Great Oxidation Event" (GOE), but also evidence of a complex fabric of mild but detectable, possibly variable, "whiffs" of environmental oxygenation preeding this event. Further, it is now documented that widespread oxygen deficiency persisted in the oceans in the wake of the GOE, but the extent of ocean euxinia was apparently of limited extent. And new ideas and insights have emerged about the effects of changes in the abundances of bioessential metals, especially Mo, on ecoystem evolution.

[1] H. D. Holland (1984). *The Chemical Evolution of the Atmosphere and Oceans*. Princeton University Press, 598 pp.

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