

PGE geochemistry of Precambrian mafic dykes from the Singhbhum Craton (India)

SISIR K. MONDAL^{1*}, INDRANIL PRAMANIK¹,
 RIA MUKHERJEE², SUBHRA P. BANK¹ AND
 M. SATYANARAYANAN³

¹Department of Geological Sciences, Jadavpur University,
 Kolkata-700032, India (*correspondence:
 sisir.mondal@gmail.com)

²School of Geosciences, University of the Witwatersrand,
 Johannesburg, South Africa

³National Geophysical Research Institute, Hyderabad, India

The Singhbhum granitic batholithic complex (SGB, 3.3-3.1 Ga) occupies the major part of the Singhbhum Craton in eastern India, which is surrounded by Archean greenstone belts. The SGB is intruded by the N-S, NNE-SSW, NNW-SSE and E-W trending mafic dykes known as the Newer Dolerite Dyke Swarm with reported ages ranging from 2500-950 Ma. This study focuses on three differently trending mafic dykes sampled from Kaptipada (NNE-SSW), Satkosha (NW-SE) and Keonjhar (N-S) areas in the Orissa state. The dykes show variation in grain size and modal mineralogy across the trend; plagioclase, orthopyroxenes, and clinopyroxenes are the major minerals and phlogopite, magnetite and ilmenite are the minor minerals. Major elements show that the Satkosha dyke is basaltic whereas, the Keonjhar and Kaptipada dykes are boninitic or low-Ti high-Mg siliceous basaltic in composition. The Kaptipada dyke shows 'U' shaped chondrite normalized REE similar to Phanerozoic arc-derived boninitic magmas, whereas, Sathkosia dyke has more evolved REE. In primitive mantle (PM) normalized plots all dykes show similar PGE fractionated patterns that are enriched in Pd, Pt and Rh relative to Os, Ir and Ru. The Keonjhar dyke shows more fractionated PGE (Pd/Ir \approx 72-132) than the Kaptipada (Pd/Ir \approx 25-42) and the Sathkosia dykes (Pd/Ir \approx 21-37). The Pd/Ru ratios range from 4.0-26 (Kaptipada Pd/Ru \approx 4.0-6.0; Sathkosia Pd/Ru \approx 6.0-15; Keonjhar Pd/Ru \approx 13-26) which is higher than primitive mantle (Pd/Ru \approx 0.79). The Pd/Pt ratios range between 1.4-4.0 (Kaptipada Pd/Pt \approx 1.4-3.6; Sathkosia Pd/Pt \approx 2.0-4.0; Keonjhar Pd/Pt \approx 1.4-3.6) which is also higher than primitive mantle (Pd/Pt \approx 0.5). In the PM normalized plots all dykes have depleted Ni and Cu than the PGEs suggesting parental magmas had not undergone prior sulfide liquation. This study suggest that the dykes are not co-genetic and the parental magmas were generated in supra-subduction zone to MORB like settings through different stages during stabilization of the Singhbhum Craton.