ABSTRACT

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Title: Combined Palaeomagnetic and Anisotropy of Magnetic Susceptibility (AMS) Study of High Grade Rocks from Kondapalle Area, Eastern Ghats Belt, India.

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The present study is an integrated approach towards the petrography, rock magnetic. Anisotropy of Magnetic Susceptibility (AMS) and palaeomagnetic studies of the high-grade metamorphic rocks in and around Kondapalle Pangidi Layered Complex (KPLC), Eastern Ghats Belt (EGB), India. This study aims at determining the petrography, generations of Fe-Ti oxides, rock magnetic properties, magnetic remanence carriers, magnetic fabrics and the stable magnetic vectors (ChRM) present in the studied rocks and its corresponding pole positions.

The rock magnetic properties and the magnetic fabrics from AMS studies are used to determine their tectonic implications. Magneto-mineralogical study reveals that the chief remanence carrier mineral is titanomagnetite. There are three generations of Fe-Ti oxides are observed. They are primary homogeneous titanomagnetite, primary inhomogeneous titanomagnetite (high temperature and low temperature phases) and secondary ultra-fine-grained Fe-Ti oxides. Rock magnetic studies including Isothermal Remanent Magnetization (IRM), back-field IRM, hysteresis loop studies, and thermo-magnetic studies reveal the same. The magnetic hysteresis parameters (remanence and coercivity) are used to determine the magnetic domains from a modified Day plot. The magnetic domains lie within Stable Single Domain (SSD) and Pseudo Single Domain (PSD) ranges, thereby explaining their potential to record an ancient magnetic field. Also, mineral magnetic measurements and related inter-parametric ratios (e.g., χ, ARM, SIRM, ARM/χ, SIRM/χ, χ_{fd} %, S-ratio) exhibit the same. Besides the ferrimagnetic remanence carriers, paramagnetic silicates are also dominant which controlled the development of magnetic fabric, which is revealed from the AMS study. The magnetic fabric bears analogy with the regional structures and bear tectonic implications related to the post-rifting closure of the ocean followed by subduction of the ocean basin, accretionary orogeny and felsic magmatism in the Indo-Antarctic continental blocks.

Three mean ChRM components have been determined from alternate field (AF) demagnetization analysis of the rocks with predominant remanent component over induced component. These components do not include a significant record of the present earth's magnetic field. These are D_1 (D/I=20.8°/35.1°), D_2 (D/I=312.5°/53.7°) and D_3 (D/I=42.6°/-10.3°). These vectors are carried by primary high temperature and low temperature phases of titanomagnetites and probably acquired over a long period of geologic time during post-metamorphic uplift-related cooling. Each mean ChRM direction defines palaeomagnetic pole positions, which are K_1 (70.04°N/159.61°E), K_2 (44.12°N/22.43°E), and K_3 (42.56°S/14.28°E) respectively. The poles were dated (correlating with the existing accepted pole positions available in the literature) to be of the age group ~1700-1900 Ma, ~1500-1700 Ma and ~1100-1200 Ma respectively. The acquisition of first two ChRM components correspond to UHT metamorphism and emplacement of KPLC respectively while the third acquired during post-metamorphic uplift related tectonism.

Results from all the parameters and attributes together contribute towards the genesis of the various magnetic properties of the Kondapalle Pangidi Layered Complex of the Eastern Ghats Belt, India.

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