Exploring New Frontiers in Raw Material Resources: Mineralogical Insights from the Umra-Mubarak-Abu Karahish Region

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This study thoroughly investigates the mineralogical intricacies of granitic and gneissic rocks from the Umra-Mubarak-Abu Karahish region. Utilizing electron microprobe analyses related EDX and WDX techniques, we unravel a rich diversity in their mineral compositions, indicative of the complex metamorphic processes shaping their evolutionary regime.

In our approach, we leverage our extensive experience with the Najd Fault System in the Eastern Desert of Egypt and other shear zones in the region to conduct an integrated study. Our primary focus is on the Mubarak post-accretionary belt, Abu Karahish and El Umra complexes, where we aim to relate their evolutionary trajectory to existing knowledge of basement complexes in the region. Specifically, we seek to determine the temperature, pressure and times of peak metamorphism, discerning between hypotheses regarding exhumation mechanisms.

The amphibole chemistry reveals a predominance of calcic compositions, suggesting a wide temperature range from approximately 570 to 780°C. Biotite analysis uncovers a nuanced metamorphic history with temperatures varying between 370 and 690°C, implying multiple metamorphic phases. Chlorite geothermometry depicts fluctuating thermal conditions, reflecting a variable thermal history. Plagioclase chemistry exhibits compositional variations consistent with metamorphic conditions.

Our findings highlight a pressure-temperature path characterized by moderate to high-pressure conditions (6 to 8.5 kbar) and a temperature spectrum spanning from relatively low to high, illuminating a complex metamorphic evolution. Through this study, we aim to contribute significantly to unraveling the tectonic evolution of the Umra-Mubarak-Abu Karahish area, offering valuable insights into the intricate processes shaping its geological history as a part of the Central Eastern Desert.