

PETROGRAPHY AND GEOCHEMISTRY OF THE MID-TRIASSIC TREDIAN SANDSTONE IN THE SALT AND TRANS INDUS SURGHAR RANGES, PAKISTAN: IMPLICATIONS FOR PROVENANCE

Kamil Ahmed Qureshi¹; and Mohammad Arif^{2,3}

¹*Department of Earth Sciences, COMSATS Abbottabad*

²*Department of Geology, University of Peshawar*

³*Department of Earth Sciences, Abbottabad University of Science and Technology*

kamilqureshi@ciit.net.pk

Abstract

An excellent exposure of the Mid-Triassic Tredian Formation was studied in detail in the Nammal Nala, Landa Pasha and Gulakhel sections of the Salt Range and Trans Indus Surghar Ranges, Pakistan. The Tredian Formation principally consists of sandstone with some intercalations of carbonaceous shale and dolomite. Twenty-nine representative samples were examined in thin sections using polarizing microscope. Besides, eight of these petrographically investigated samples were analyzed for major and trace elements using XRF. The most abundant framework constituent in the studied samples is quartz (averaging 49 modal %). Although both the mono-crystalline and polycrystalline varieties of quartz are observed, the latter constitutes less than 1% of the total rock volume. Whereas some of the polycrystalline quartz grains contain <3, others contain >3 sub-grains. Most of the monocrystalline quartz grains display uniform extinction; however, undulatory extinction is noticed in a few of the larger grains. The type of grain contact ranges from pointed, long, concavo-convex to suture. Feldspar, including both alkali feldspar and plagioclase, constitutes only 14% of the total framework grains. The heavy mineral assemblage in the Tredian sandstone consists of tourmaline, rutile and zircon. The most abundant cementing material is calcite; however, silica, dolomite and iron oxide cements also occur in the studied samples. Petrographic and geochemical details suggest that the Tredian sandstone ranges from sub-feldspathic arenite to feldspathic arenite and hence is mineralogically sub-mature. The sub-angular to rounded outlines of framework constituents and moderate degree of sorting point to the texturally sub-mature to mature character of the sandstone. The petrographically and geochemically determined tectonic setting, physiography of the region and the southeast dominated paleo-current direction, as deduced from the observed sedimentary structures, all suggest Indian Craton as the most probable source area for the Tredian sediments. The nature and optical character of the major framework constituents and composition of the heavy mineral assemblage suggest that the sediments were largely derived from acidic (felsic) igneous rocks. The indices of alteration, weathering and compositionally variability, and major and trace element characteristics reveal arid to semi-arid paleo-climate and low to moderate degree of weathering conditions at the source area for the Tredian sediments and their deposition under oxidizing conditions in strongly continental environments.