# MINERALGICAL AND BENEFICIATION STUDIES OF THE IRON AND ASSOCIATED COPPER ORES OF DAMMAL NISAR, SW CHITRAL, NW HIMALAYAS, PAKISTAN

**M. Naveed Anjum[1, 2], Muhammad Arif[1], and Liaqat Ali[2],**

*[1]Department of Geology, University of Peshawar, Peshawar, Pakistan*

*[2]National Centre of Excellence in Geology, University of Peshawar*

## Abstract

Medium-grade iron and copper ore deposits occur in the Dammal Nisar area of lower Chitral, NW Pakistan. They are distributed as small to medium size lens-shaped bodies in the volcanic and metasedimentary rocks of the Gawuch Formation along the eastern contact of the Mirkani-Lawari plutons. A detailed mineralogical investigation using petrographic, X-ray Diffraction and SEM-EDX techniques shows that the deposits consist of magnetite, hematite, malachite and occasional bornite and pyrite as the principal ore minerals and quartz, garnet, epidote, calcite, pectolite, serpentine and foshagite as the main gangue phases. On the basis of field observations and mineralogical composition, the studied ore bodies may be classified as skarn-type magnetite deposits. Being medium-grade in their current form, different beneficiation techniques including gravity separation, magnetic separation and froth flotation were employed to assess the up-gradation potentials of the Dammal Nisar ore. The results reveal that Fe2O3 concentrates of 85.6 wt. % at 45% recovery and 87.2 wt. % at 63% recovery are obtainable by gravity separation after sample feeds with 72-75 wt. % Fe2O3 contents are ground at 20 and 25 minutes intervals, respectively. As such, the studied ores can be utilized in steel manufacturing. Furthermore, an average of 1.9 and 5.5 wt. % Cu is obtainable from the studied ore samples with 0.28 to 0.68 wt. % Cu through froth flotation. Besides, more than 60% of the sample grain size was reduced to <106 microns, when subjected to a grinding interval of up to 25 minutes, thereby, enhancing liberation of ore from gangue and hence a relatively high recovery of Fe and Cu.

**Key Words:** Iron and copper ores, mineralogy, beneficiation, Dammal Nisar, Chitral