

## Study of mass changes of elements during skarnification processes in east of Sungun-Chay river, NE of Tabriz, Iran.

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**Abstract:** Copper-bearing skarn zone in east of Sungun-Chay river is located about 100 km NE of Tabriz, and was developed along the contact of the mineralized porphyry granitoid stock (Oligo-Miocene) with impure carbonate rocks (Upper Cretaceous). Both endoskarn and exoskarn occurred in this zone. Endoskarn is narrow (~0.5-2m) whereas exoskarn is relatively broad (25-55m) and contains minerals such as calc-silicates (grandite, diopside-hedenbergite, tremolite-actinolite, epidote), silicates (quartz, chlorite, and clays), sulfides (pyrite, chalcopyrite, sphalerite, galena, bornite), oxides (magnetite, hematite), and carbonates (calcite, ankerite). Skarnification processes occurred in two distinct stages, including progradation and retrogradation. Calculations of chemical index of alteration (CIA) indicate that the exoskarn underwent metasomatic alteration within the range of 8.41% to 57.29%. Analysis studies of mass changes of elements, on the basis of Nb (as a monitor immobile element), indicate that considerable amounts of elements such as Fe, Si, Mg, S, Cu, Pb, and Zn were added to the skarn system by hydrothermal fluids from the side of pluton, while substantial amounts of Ca was leached out of the system. The overall obtained results show that elements such as Fe, Si, and Mg were introduced into the skarn system by metasomatizing fluids during both progradation and retrogradation stages whereas the ore-forming elements such as Cu, Pb, Zn, and S were added to the system mainly during retrograde stage. The inharmonious mass increase of Al and portion of mass changes of Si are due to the local variations of pelitic impurities within the carbonate rocks (as protolith).

**Keywords:** *Exoskarn; Chemical index of alteration; Mass changes; Skarnification; Sungun.*