National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: Effects of serpentinization and sulfur cycling in ultramafic rocks of the Neotethyan ophiolites along the Himalayas
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Venue	: ER303
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Abstract	: The petrographic study of highly serpentinized ultramafic rocks is characterized by the presence of relict olivines and orthopyroxenes exhibiting porphyroclastic texture. Orthopyroxene grains exhibit bastite texture pseudomorphing the primary relict grains and are altered along their rims to form lizardite. Olivine grains have been mostly altered to lizardite having mesh and hourglass texture and show characteristic peaks at 230 cm^{-1}, 383 cm^{-1} and 692 cm^{-1} under Raman spectroscopy. Chrysotiles are observed to have fibrous vein cross-cutting relict orthopyroxene and olivine grains and show peaks at around 135 cm^{-1}, 232 cm^{-1}, 385 cm^{-1} and 694 cm^{-1}. Antigorites show interlocking to interpenetrating planar texture peaking at 229 cm^{-1}, 377 cm^{-1} and 687 cm^{-1}. These antigorites surround the relict primary olivine grains which are crosscut by brucite veins showing characteristic peak at 276 cm^{-1} and 442 cm^{-1}, 721 cm^{-1} and 1086 cm^{-1}. Magnetites are formed as alteration products along the rims of chromites and within the serpentine veins indicating mature stage of serpentinization. Lizardite and chrysotile commonly occur during sea floor serpentinization at temperature condition ranging between 50-400˚C. Antigorite mostly occurs in a subduction setting and formed at temperature between 300-600˚C. Mineral chemistry data of serpentines exhibit wide variation in MgO (8.66 wt. % to 27.20 wt. %) and FeO (4.10 wt. % to 12.26 wt. %). However, SiO_2 (43 wt. % to 40.82 wt. %) and Al_2O_3 (0.16 wt. % to 1.07 wt. %) content in serpentines varies within a small range indicating that Si and Al are relatively immobile compared to Mg and Fe during serpentinization. The crosscutting brucite veins have high MgO and FeO composition of 50.53 wt. % and 16.56 wt. % respectively. Mg# of serpentines vary between 0.80 to 0.85, which is much lower than olivines (Mg# = 0.91-0.92) and pyroxenes (Mg# = 0.91-0.97) indicates that magnesium loss has been taken place during serpentinization from the primary minerals. High CaO (22.84 wt. % to 24.73 wt. %) content in diopside grains than the surrounding serpentine grains (0.19 wt. % to 0.55 wt. %) implies that Ca has been removed from the serpentines during serpentinization. The base metal sulfide (BMS) mineral assemblages in serpentinized Spongtang ultramafics are dominated by presence of pyrrhotite, pentlandite, awaruite, magnetite and a few Cu-Fe-Ni alloys Magnetites are the most dominating alteration products formed within serpentinized veins and along the chromite rims suggesting prevailing reducing condition during their mineralization. Pyrrhotite, pentlandite and awaruite occur as minor phases in serpentine mesh centers and indicate presence of reducing condition at low water-rock ratio during their mineralization.