FLUID-MELT INCLUSION STUDIES ON DIFFERENT MINERALS OF PEGMATITES INTRUDING IN NELLORE SCHIST BELT, ANDHRA-PRADESH, INDIA.

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Introduction

Mica pegmatites in the Nellore schist belt are of variable shapes and sizes and occur in the form of regular and irregular stringers, veins and lenses. The emplacement of these pegmatites has been controlled by fractures along the axial planes of the folds in the schistose rocks of Dharwarian age. The country rocks of the study area are composed of hornblende-schist, quartz-mica-schist, quartzites, granite gneisses and granites.

Fluid-melt inclusion studies were carried out from different host minerals, namely, quartz, beryl, and garnet, in the mica-pegmatites. Quartz is the major host mineral studied from both the mica-rich and mica-barren sites/zones of the different pegmatites.

The main aim of this paper is to characterize the fluid-melt inclusions of pegmatitic minerals within mica-barren and mica-rich sites/zones of different pegmatites from the study area. The potential use of fluid-melt inclusion studies in mineral exploration is also evaluated.

Samples from four different mineral associations were studied: I) barren quartz, II) quartz associated with muscovite mica–books III) beryl associated with muscovite mica-books, and IV) garnet associated with muscovite mica-books. There are large differences between these different samples/associations in terms of the different fluid-melt inclusion types recognised (Roedder, 1984) and their microthermometric characteristics.

Fluid inclusion studies

I.) Barren quartz: Fluid inclusions show wide variations in size and shape. Almost all the quartz samples contain high abundance of inclusions, comprising liquid-rich and vapour-rich biphase, liquid-rich monophase types (Plate 1).The size varies from 5μm to 30μm. Trails of secondary fluid inclusions (4μm to 10μm) are very common in these samples .

II.) Quartz associated with muscovite mica-books: Primary fluid inclusions are predominant. They are divided in to four types, viz. 1) Type 1 (H_2O rich, biphase), 2) Type 2 (Monophase CO_2 inclusions), 3) Type 3 (Biphase H_2O-CO_2 -NaCl inclusions) and 4) Type 4 (Polyphase, H_2O-NaCl inclusions) (Plate 2).The size of these fluid inclusions varies from 10μm to 40 μm.

III.) Beryl associated with muscovite mica-books: Both primary and secondary fluid inclusions are present. Most are H_2O-NaCl, biphase types with sizes in the range 4μm to 30μm (Plate 3).

IV.) Garnet associated with muscovite mica-books: 1)Type 1 (Biphase, H_2O-NaCl), 2)Type 2 (Monophase CO_2 inclusions) and 3) Type 3 (Biphase, H_2O-CO_2-NaCl).(Plate 4)

Melt inclusion studies

There are three main groups (Plate 5), which are further classified based on the classification of melt inclusions given by Zhaolin,(1994); 1) Amorphous, 2) Crystalline and 3)Crystalline-fluid.

I.) Barren Quartz: Crystalline and amorphous melt inclusions are present.

II.) Quartz associated with muscovite mica-books: Crystalline and crystalline-fluid types of melt inclusions are the main types found in these samples.

III.) Beryl associated with muscovite mica-books: In these samples only crystalline-fluid types of melt inclusions are present. Garnet associated with muscovite mica-books: These samples are having presence of all the three types of melt inclusions, viz. 1)Amorphous, 2) Crystalline and 3) Crystalline fluid-melt inclusions.

Micro thermometric studies of fluid inclusions

Barren quartz samples containing primary biphase liquid-rich fluid inclusions showed wide range of homogenization temperatures (180^0 to 340^0 C), with low salinity of 1.49 to 9.71 wt.% NaCl eq.. Beryl associated with muscovite mica-books indicated the homogenization temperatures ranging from 210^0 to 260^0 C, with low salinity ranging from 3.92 to 9.50wt.% NaCl eq.. The quartz and garnet, associated with muscovite mica-books; both showed identical trapping temperatures (250^0 to 500^0 C) aswellas trapping pressure values (1000 to 3500bars). The salinity vs. temperature of homogenization diagrams suggests that the liberalization might have formed by simple cooling of magmatic fluids without any mixing.

The fluid-melt inclusion studies from quartz provide evidence for high solute composition in primary aqueous vapor phase pegmatitic fluid. Primary fluid inclusions in beryl and garnet are also found to be of high salinity (rich in polyphase fluid

inclusions) and are generally interpreted to represent dense, hydrous, silicate fluid that contain 45-85 wt.% of dissolved silicates.

References

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