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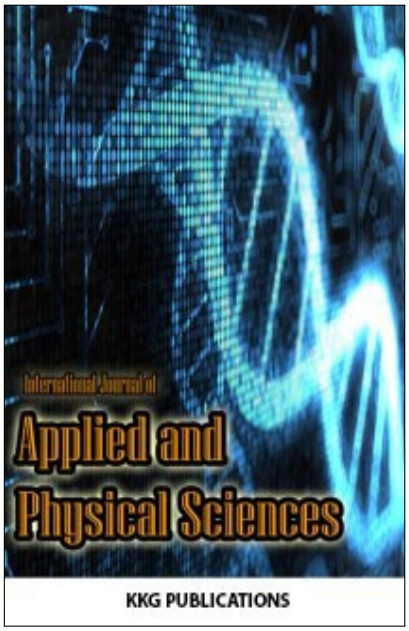


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# DETERMINATION OF ORE FORMING FLUID'S DENSITY OF FLUORITE ORE DEPOSITS OF CENTRAL ALBORZ

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**Abstract**. There are different ore deposits in Central Alborz, which are distributed from east to west. Except for the Emaft fluorite ore deposit, other ore deposits in the upper and middle members of the Elika formation belong to the Triassic age and are covered by Palan evaporated formation. The genesis of these deposits is considered diagenetic to epigenetic. Fluorite reservoirs filled with faults or karst zones (open space filling) originate in epigenetic. Layers and lenses are supposed as digenetic. This fluorite, a double polished thin section (polished wafers), was prepared, and its salinity and homogenization temperature of fluid inclusion were tested using Linkham Tm 600 model. Despite the geographical distribution of ore deposits, the results showed that their density is the same everywhere, but redeposit with digenetic or digenetic characteristics showed lower salinity. According to the salinity and homogenization temperature characteristics, these ore deposits are classified in Irish to MVT type.

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## INTRODUCTION

Studied deposits are located between 52 15-53 40 latitude and 36 59-35 5 longitudes in the east of the Central Alborz, Haraz roads partition towards the west and Sari-Damghan towards the east. In this region, 9 chains of fluorite deposits in a thin layer with the width of 30 kilometers and with the length of 150 kilometers are distributed in which from west to east Baijan (60 kilometers far from south of Amol), Deraseleh, Ashchal, and SheshRoodbar( 30 kilometers far from south of Zir-Ab), Kamarposht, Sarcheleshk (15 kilometers far from south-east of Pole Sefid), Emaft (30 kilometers far from south-east of Pole Sefid), Pachimiana (90 kilometers far from south of Sari) and Era located 100 kilometers away from South-east of Sari are present.

The Host rock of all ore deposits except Emaft, is Elika but Emaft deposit is located in Tizkooh formation which could be dated back to the Cretaceous age [1], [4], [8], [10], [11], [12]. In the place of fluorite ore deposits, Elika formation has two middle parts or Dolomite and carbonate or it consists of the upper member that is covered by informal Paland formation. Paland formation includes evaporated marl and Gypsum units along with thin dolomite layers [10], [12].

## MATERIALS AND METHODS

From this fluorite a double polished thin section (polished wafers) was prepared and its salinity and homogenization temperature of fluid inclusion were tested using Linkham Tm 600 model. If the fluid inclusion homogenization temperature and salinity are available, by neglecting the condition of trapping and using two variants considered as X and Y axes, we can judge about the changes of hydrothermal fluid density and genesis of ore deposits [9], [13].

## RESULTS AND DISCUSSION

Figure 1 to 5 illustrate the lines of Fluid inclusion density for the fluorite ore deposits of the region. In other words, this figure illustrates the density lines due to the obtained amplitude in relation to the salinity and homogenization temperature for fluorite ore deposits of the region. As it is observed in figure 1, three groups of fluid inclusion are distinguished according to their density.

The first group has the average density of about 1 g/cm$^3$, this group has low salinity and its homogenization temperature is somehow stable. The second group has a density of about 1.05 and medium salinity and its homogenization temperature is a little lower than the first group. The third group has a density higher than 1.1 and high salinity and their homogenization temperature is lower than the two former ones.

The reason of this difference is due to the sample locations in ore deposit limitation. The fluid inclusion in the third group has the highest density. This fluid inclusion is selected from the central part of the ore deposit and is in contact with Paland evaporated formation (Site a); because of matter their

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salinity is so high. The second group is selected from the south seam and dyke vicinity and it is always boiling so this is the reason why some of them have high homogenization temperature [5], [6]. As it is far from the Paland formation its salinity is lower than the first group and is considered as the northwestern part of ore deposit that is far from both Paland formation and Dyke of the ore deposit limitation.

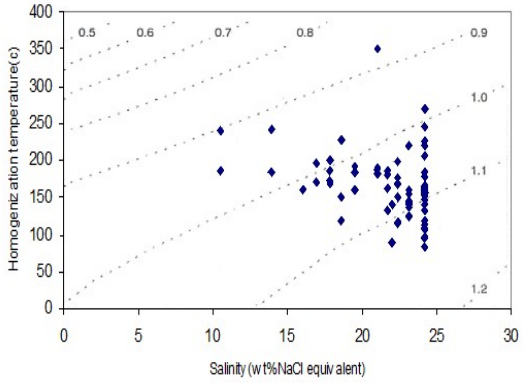


Fig. 1 . The changes of hydrothermal fluids (ore forming fluids) density in Fluorite ore deposits in eastern part of central Alborz (Site a)

Figure 2 illustrates the changes of the fluid inclusion density in fluorite ore deposit of Pachimiana ore deposit (Site b). However the obtained points have vast distribution but they can be divided into two groups. The first group has the density of more than 1.1 g/cm$^3$ and their density differs between 1-1.1 g/cm$^3$. These two groups can be further divided into two other sub-groups with respect to their homogenization temperature. One group has low homogenization temperature and the other has high homogenization temperature. The reason of great changes in these fluids is the condition of their formation, as these samples are selected from digenetic crystallization rhymite or DCR (for example Geodo & digenetic Lenzes) that passes through different stages of digenesis. It is obvious that during the digenesis' time, the ore fluid forming will be saltier and more caliginous and thus the existing fluid in the later digenesis stage on the contrary with the first one has the higher density [2], [3], [7]. The changes of the fluid inclusion in Ashchal ore deposit range from 0.95 -1.1 g/cm$^3$.

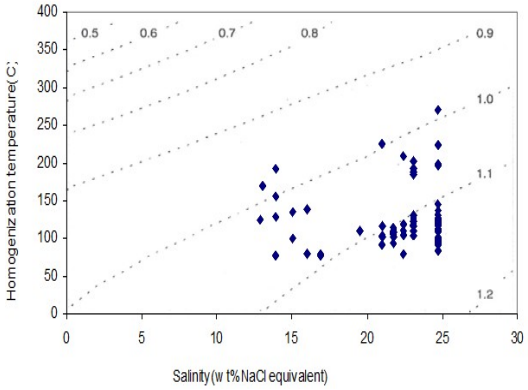


Fig. 2 . The changes of hydrothermal fluids (ore forming fluids) density in Fluorite ore deposits in eastern part of central Alborz (Site b)

As it is shown in figure 3, the changes of this fluid are studied prior to the other parts of ore deposit (Site c). Given that fluorite samples are selected from different stratigraphics in this ore deposit, the changes of salinity and density seem natural. Evidently, the nearer to the Paland formation, the saltier they are. Due to the pale geography of Triassic basin and adjacency to the upper Triassic having more salinity evaporation, these obtained data and results are correct. Fluorite mineralization occurs in shape of Lenz or layer in some horizons and no epigenetic fluorite is seen in this region [10], [12].

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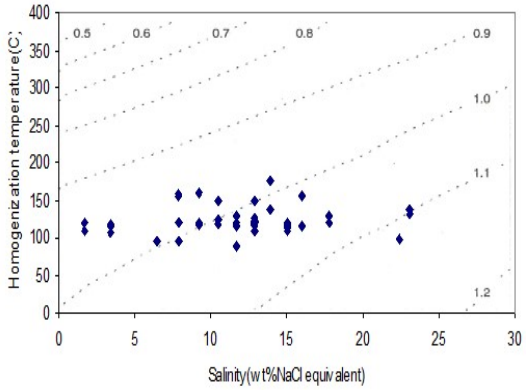


Fig. 3 . The changes of hydrothermal fluids (ore forming fluids) density in Fluorite ore deposits in eastern part of central Alborz (Site c)

The density of ore forming fluid of SheshRoodbar (Site d) is fitted mostly with density line that is observed in figure 4. As it is shown in this figure, continuity of changes of salinity is followed by a relatively steady homogenization temperature and this characteristic leads to gradual density in fluid inclusion. This matter is more consistent with the approach of the digenetic source [10]. It must be noted that the fluorite ore deposit is selected from digenetic crystallization rythmite in this ore deposit.

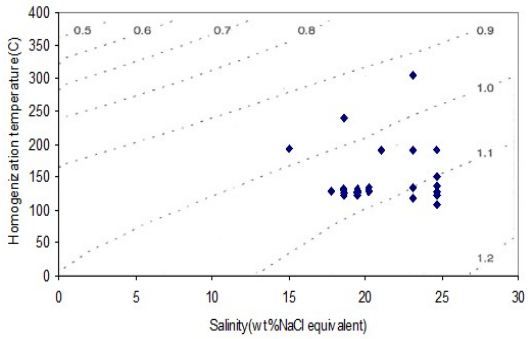


Fig. 4 . The changes of hydrothermal fluids (ore forming fluids) density in Fluorite ore deposits in eastern part of central Alborz (Site d)

Figure 5 shows the changes of density for fluorite ore deposit of Emaft (Site e). As this figure shows, the density of ore forming fluid hangs from 0.9 -1.1g/cm$^3$. As it is illustrated in the figure, the highest amount of frequency of density is in 1 g/cm$^3$ limitation.

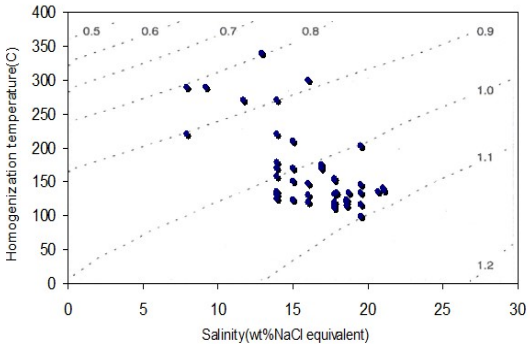


Fig. 5 . The changes of hydrothermal fluids (ore forming fluids) density in Fluorite ore deposits in eastern part of central Alborz (Site e)

## CONCLUSION

However, the fluorite ore deposits of Central Alborz have great geographical distribution but the ore forming fluid in ore deposits has considerable density and the density of the fluid inclusion in these ore deposits is near to each other. On the other hand the changes that are seen in the ore deposit or in different ore deposits depend on the local phenomenon like the existence of Paland formation and Igneous rock or faults. Based on this, the ore deposits with the digenetic base because of the gradual nature of fluid, have consistent salinity and density. In addition, the ore deposits that show a range of sedimentary and digenetic characteristics show lower salinity and temperature of trapping (ore forming temperature). For example, in Ashchal ore deposit that has only sedimentary and digenetic characteristics, the fluid inclusion has the lowest average salinity. On the contrary, fluorite ore deposits that are filled in the open space of faults zone and fracture have higher salinity and the temperature of trapping.

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— This article does not have any appendix. —