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C and O isotope geochemistry of auriferous Quartz Carbonate Veins of Jonnagiri Gold Deposit, Eastern Dharwar Craton, southern India: Implication for source of mineralizing fluids in granodiorite hosted gold deposits

Manisha Kesarwani,^{1*} S.Sarang¹,
B.G.George², J.S.Ray², R.Srinivasan³, V.N.Vasudev⁴

¹ Department of Applied Geology, ISM-Dhanbad, India
(kesarwanimanisha5@gmail.com)

² Physical Research Laboratory, Ahmedabad

³ IISc, Bangalore Karnataka

⁴ Geomysore, Karnataka

Gold deposits in Neoproterozoic Jonnagiri greenstone belt of southern India are hosted in the auriferous quartz veins (QCVs) emplaced in sheared granodiorites and is of the only one of this kind so far reported from India, similar to those reported from other places of the world such as Jiadong Peninsula, China [1,2,3]. Though a magmatic or mantle origin has been suggested for this kind of gold deposits of China based on isotope studies [2,3], a H₂O–CO₂–CH₄+salt of metamorphic fluid has been suggested for the origin of Jonnagiri deposit, India based on fluid inclusion studies [4]. No isotope studies have been done so far for the granodiorite hosted gold deposit of Jonnagiri, India.

We, therefore, for the first time, report C and O isotope composition for the carbonates of the auriferous carbonates from the QCVs that constitute the ore veins to constrain the source of mineralizing fluids for this deposit. All samples are from drill cores. 68 samples were analysed for Carbon ($\delta^{13}\text{C}_{\text{pdb}}$) and Oxygen ($\delta^{18}\text{O}_{\text{smow}}$) isotopes.

The $\delta^{13}\text{C}$ values of the QCVs are in the range between -1.9 and -12.6 (average $-5.2\pm 1.9\%$). Corresponding $\delta^{18}\text{O}$ values range from 1.4 to 20.6‰ (average $8.5\pm 3.9\%$). Barring a few exceptions, most of the $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values including their averages are consistent with mantle or magmatogenic origin of the fluids. The average $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values of such fluids are $-6\pm 2\%$ and $8\pm 2\%$ respectively [cf.5]. The samples with isotopic ratios away from these ranges and averages may be due to alteration by fluids of various origins, both under low and high temperature conditions. We propose a juvenile magmatic or mantle source for the auriferous fluids responsible for granodiorite hosted Jonnagiri gold deposit similar to those reported from Jiadong Peninsula, China [3].

[1] Jairam, et al., 1996, Records GSI 129, 29–31 [2] Goldfarb and Groves 2015, Lithos 233, 2–26 [3] Qiu et al. 2002 MD 37, 285-305 [4] Sarvanan et al., 2009, OGR 36, 333–349 [5] Ohmoto, 1986 Rev Mineral Soc of Am 16, 491-560.

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