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C and O isotope systematics of auriferous Quartz Carbonate Veins, Western Lode Systems, Archaean Gadag Gold Field, Dharwar Craton, India: Implication to the source of mineralizing fluids for orogenic gold deposits

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The Neoarcahean orogenic type gold deposits of the Western Lode Systems (WLS), Gadag Gold Field (GGF), Dharwar Craton, India are hosted by quartz carbonate veins (QCV), emplaced in pillowed metabasalts and andesites [1,2]. The C and O isotope composition of the host auriferous QCVs of these deposits have been studied for the first time to constrain the source of mineralizing fluids. The QCV samples were mostly collected from the mine dumps, abundant open cast mines and drill cores provided by Ramgarh Mines and Metals Private Ltd (RMMPL), Gadag and were analysed for Carbon ($\delta^{13}C_{pdb}$) and Oxygen ($\delta^{18}O_{smow}$) isotope compositions at Physical Research Laboratory, Ahmedabad.

The $\delta^{13}C_{pdb}$ values of the QCVs show a bimodal range. Of the total 66 samples analysed, 21 samples range between -0.7 to -2‰ (average -1.3±0.4‰) with $\delta^{18}O$ values ranging 10.3 to 11.4 ‰ (average 10.6±0.4‰). While the other 43 samples show a $\delta^{13}C$ and $\delta^{18}O$ range of -2.8 to -7.8‰ (average -4.1±1‰) and 7.6 to 20.3 (average 11.5±2.2‰) repectively. While the former group of data are consistent with the $\delta^{13}C$ values of metamorphosed carbonates of Chitradurga Schist Belt [CSB, 3], the latter group are consistent with $\delta^{13}C$ and $\delta^{18}O$ values of mantle or magmatogenic carbonates [4]. Therefore, it might be possible that the auriferous fluids for the WLS deposits have a dual source with a major mantle or magmatogenic and a minor metamorphic source. However, almost all the $\delta^{18}O$ values are similar to those of mantle or magmatogenic fluids. Also, it has been have shown that such heavier $\delta^{13}C_{pdb}$ values can also result from extreme later water-rock interaction [5]. Therefore, we propose a major mantle or magmatogenic source of auriferous fluids.

[1] Chakraborty et al.,1992, Unpublished Report GSI, [2] Ugarkar et al.,2016, OGR, 1224–1242 [3] Das Sharma et al., (1994) Current Science 66, 857-860. [4] Ohmoto, H 1986 Rev Mineral Soc of Am 16, 491-560 [5] Swain et al.,2015, OGR, 70, 305-320

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