Mantle origin for auriferous CO_2 rich fluids at the Archaean lode gold deposit of Ajjenahalli, Chitradurga greenstone belt, southern India

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Based on fluid inclusion, metamorphic and geochemical studies a metamorphic or magmatic origin for the source of ore fluids (circulated at 300 ± 50°C) has been suggested for the BIF hosted Archaean lode gold type of mineralization at Ajjenahalli, Chitradurga greenstone belt of southern India [1-3]. The BIFs here are traversed by quartz-carbonate veins, which sometimes host or are spatially associated with gold[4].We present here the C and O isotope compositions of carbonates from auriferous quartz-carbonate veins, and compare them with those of meta-sedimentary carbonates and carbonated metabasalt of the same area and try to understand the source of the mineralising fluid. The average $\delta^{13}C$ values of auriferous hydrothermal carbonates are -5.1±1.4‰. The average fluid $\delta^{13}C$ values (i.e. $\delta^{13}C_{\sum C}$) calculated following [5] is -5.81±1.14‰. The average $\delta^{13}C$ values of carbonate BIF facies and carbonated metabasalt are -1.8±0.1‰ and-1.4‰ respectively. Since dissolution or decarbonation reaction produces CO_2 with similar or enriched $\delta^{13}C$ values than the precursor carbonates and oxidation/hydrolysis of carbonaceous sediments with a $\delta^{13}C$ value of -26±7‰ can produce CO_2 with $\delta^{13}C$ values always less than -10‰ at 300°C [5], we consider that the carbonates $\delta^{13}C$ values of the auriferous hydrothermal carbonate veins represent mantle or magmatic values. The average $\delta^{18}O_{smow}$ values of these auriferous hydrothermal carbonates is 14.1±2.7‰. Previous studies on silicate O-isotope and sulfide S-isotope studies in the same deposit have yielded silicate and fluid $\delta^{18}O_{SMOW}$ ranges of 13.6 to 14.4‰ and 6.5 to 8.5‰ respectively and $\delta^{34}S$: 2.1‰ to 2.7‰ [2], which are also in consistent with magmatic or mantle derived values and not with processes such as metamorphism of sediments as suggested [1,2]. Since the precise age of felsic magmatism vis-à-vis age of gold mineralization in this deposit is as yet unknown, and deposit is spatially located on a crustal scale shear zone [2, 6] we propose that CO_2 rich fluids responsible for gold mineralisation at Ajjenahalli gold deposit could be the result of direct mantle derivation, as such shear zones, can penetrate deep into mantle[7]. [1] Pal & Mishra (2004), *Gond. Res*. **6**, 531. [2] Kolb *et al*., (2004) *Econ. Geol*. **99**, 743. [3] Prakash (2000) Unpubl. Ph.D, Bangalore Univ. [4] Prabhakar *et al*., (2001) *GSI*, **58** [5] Ohmoto & Goldhaber (1997) *Geochem. Hydro. Ore Dep.* 517. [6] Chardon *et al*.(2008) *JGR* , **113** [7] Pili *et al*.(1997) *Tectonophysics* **280.**

The GEOROC database – A decade of "online geochemistry"

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Since its introduction 10 years ago, the geochemical database GEOROC of the Max-Planck Institute for Chemistry, Mainz (http://georoc.mpch-mainz.gwdg.de), became a tool used in a wide spectrum of geoscientific research areas. Whereas in the beginning GEOROC was popular mainly in the "Ocean-Island-Basalt" community, in the meantime, applications are numerous in the study of volcanic rocks from other tectonic settings but also in sedimentary, (paleo)-oceanographic, as well as atmospheric research. In high-temperature geochemistry, compilations from GEOROC are used to model the compositional evolution of the Earth's mantle through time as well as to estimate the composition of the bulk continental crust.

Thus, the end-member composition of the Earth's mantle is evaluated by means of GEOROC compilations of major and trace element contents and isotope ratios of volcanic rocks from ocean islands, convergent margins and continental flood-basalt provinces. Theories of compositional zoning in plumes and the mantle are revised based on global datasets for oceanic basalts. The existence of global datasets initiated comprehensive discussions on the source composition of ocean-island basalts as well as revisions of mantle temperature estimates and the calculation of a new convective geotherm for the upper mantle. The composition of the continental crust is estimated based on compiled literature data from GEOROC.

Thus, evaluations of the global datasets available through GEOROC have not only confirmed but also initiated modifications of existing theories on the evolution and composition of the Earth's mantle and crust.