

Paper Number: 255

IDENTIFICATION OF THE GEOGENIC SOURCE OF FLUORIDE IN THE GROUNDWATER OF CHITTUR- KOLLANGOD AREA, PALAKKAD DISTRICT, KERALA, INDIA.

R, Sajeev,¹ and G.P, Gupta, ²

¹ Senior Geologist, RS Division, GSI, WR, Jaipur-302 004, India <sajeevgeologist@gmail.com>

²Dy. Director General (G), GSI, CHQ, Kolkata, India

Incidences of dental fluorosis are known in the Palakkad district of Kerala, India [1]. Unfortunately no studies could bring out a clear picture of the exact source of fluoride and its enriching mechanism in the ground water system of Palakkad. The present work is aimed to fill this information gap. Fluorosis reported area [2] taken up for the present work covers 336 sq.km area of Chittur and Kollangod Taluks of Palakkad district. Fluoride health hazard map generated through this work will be useful for the health officials for taking mitigation measures.

Geologically the study area forms part of the Precambrian metamorphic shield of Peninsular India and exposes rocks of Peninsular Gneissic Complex, Charnockite Group, Supracrustals and Felsic intrusives. Magnetite quartzite and amphibolites constitute the supracrustals and they occur as bands and lenses within the charnockite and gneisses [3]. The methodology adopted for the present work has three components i.e. pre-field data collection, field data collection and data analysis and interpretation. Hydrogeochemistry of pre and post monsoon ground water samples reveals that the source of F⁻ is the weathering of silicate minerals. The bedrock geochemistry clearly indicates that the mafic enclaves widely observed within the country rock are rich source of fluoride in the area. The XRD study reveals that fluopargasite, fluorrichterite, fluorphlogopite and fluoroannite are the sources of fluoride in the area in addition to apatite. Among the above-mentioned, fluopargasite (NaCa₂(Mg₄Al)(Si₆Al₂)O₂₂F₂), a member of the calcic amphiboles is found as the major geogenic source of fluoride in the area as it forms the major constituents of the mafic enclaves widely observed within the country rock. The groundwater of the study area is HCO₃⁻ dominated, which in turn facilitate the dissolution of F⁻ from soils and rocks. The hydro chemical process leading to increase in Na⁺ concentration appears to have played an important role in F⁻ enrichment in ground water. The study area falls in the Palakkad Gap area and it forms part of the Palakkad-Cauvery shear zone. Fractures and weak planes produced by the shearing activity might have accelerated the weathering process. This intense weathering in turn appears to have facilitated the release of fluorine into the ground water mainly from the mafic enclave (rich in fluopargasite) and also from the major rock type (hornblende-biotite gneiss), which also contains fluopargasite in addition to fluorrichterite, fluorphlogopite, fluoroannite and apatite. The fluorine released into the ground water system got enriched as fluoride because the ground water recharge is limited especially in the eastern part of the study area (being the rain shadow zone) as compared to the western part.

References:

- [1] Central Ground Water Board, Annual Action Plan (2002-03), Kerala Region. [2] Shaji E et.al. (2007) Current Science Vol.No.95 pp.240

[3] Mani.G (1959) Report on the systematic mapping of parts of Palghat District, Kerala State, GSI
Unpublished Report, pp-1-6.

