# Heavy metal pollution in soils around the abandoned mine sites of Nuggihalli Schist Belt, Karnataka, India

A. KESHAV KRISHNA*, K. RAMA MOHAN AND N.N. MURTHY

Environmental Geochemistry Division, National Geophysical Research Institute (CSIR), Hyderabad-500 606, India (*corresponding author: keshav_aradhi@rediffmail.com)

Soil pollution with potentially toxic metals represents one of the most prominent environmental hazards from abandoned mine lands, which affects many countries having historic mining industries. Heavy metals contained in the tailings are mobilized, migrate to the surroundings and cause severe and widespread contamination of soils. This paper presents the pollution load of toxic heavy metals (As, Cr, Cu, Ni, Pb, V and Zn) in 70 soil samples collected around three different abandoned chromite mining sites (Jambur, Tagdur and Byrapura) of the Nuggihalli Schist Belt, Karnataka, India by integrating chemical data of soils to help understand the source and mobility of pollutants. The Nuggihalli Schist Belt represents one of the oldest Schist belts of early Precambrian era, comprising of metavolcanics (hornblende schist and amphibolite) surrounded by Peninsular gneisses and granites with associated quartz veins and pegmatites. The primary aim of the research, which investigates the degree of soil pollution occurring at an abandoned Chromite mine, is to contribute towards the understanding of how trace element pollutants behave in soils.

Results indicated that the concentrations of heavy metals in contaminated soils ranged between 1.40 to 9.50 mg/kg for As, 44.9 to 8572 mg/kg for Cr, 13.7 to 143.9 mg/kg for Cu, 26.9 to 6113 mg/kg for Ni, 4.3 to 58.0mg/kg for Pb, 24.2 to 569 mg/kg for V and 36.0 to 256.6 mg/kg for Zn. These high concentrations in soils of the study area exceed the Soil Quality Guideline limits (CEQG 2002). The results suggest that there is a steady increase of toxic heavy metals risk in this area. The heavy metals contained in residues, active tailings, impoundments and waste rock dumps coming from mining and metallurgical operations are often dispersed by wind and/or water after their disposal. Further, the drastically disturbed mine soils in the study area indicate the potential source of adverse impacts on natural ecosystems and human health. Emphasis need to be put on control measures of pollution and remediation techniques in the study area.

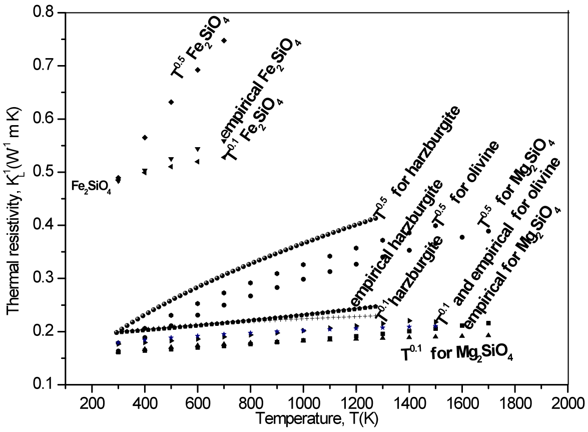
# Thermal conductivity of oxide and silicate minerals, and harzburgite

S. ARAFIN*, R.N. SINGH AND A.K. GEORGE

Department of Physics, College of Science, Sultan Qaboos University, Box: 36, Al-Khoudh 123, Sultanate of Oman (*correspondence: sayfin@squ.edu.om)

## Thermal Conductivity from Debye Temperature

The temperature dependence of thermal conductivity, $K_L$ of some oxide and silicate minerals, olivine and Harzburgite of Oman ophiolite suite has been determined from the measured seismic velocities, Debye temperature, $\Theta_D$ and an empirical relationship [1] between $\Theta_D$ and $K_L$. The temperature dependence of reciprocal of $K_L$, known as thermal resistivity, is found to increase linearly with temperature. This has helped us to determine residual thermal resistivity. The power-law relationship [2, 3] has also been shown in the figure below.




## Discussion of Results

An empirical relation connecting $K_L$ and $\Theta_D$ was used to evaluate $K_L$ for olivine. The close proximity of the estimated value (5.7 W $m^{-1}$ $K^{-1}$) to that of the experimentally determined value (5.0 W $m^{-1}$ $K^{-1}$) encouraged us to evaluate $K_L$ values of oxide and silicate minerals, and harzburgite rock which consists of olivine as the major constituent mineral. A full discussion of the results will be available after the analysis is completed.

[1] Horai & Simmons (1970) *J. Geophys. Res.* **75**, 678–682. [2] Roufosse & Klemens (1974) *J. Geophys. Res.* **79**, 703–705. [3] Xu *et al.* (2004) *Phys. Earth Planet Int.* **144**, 321–336.