Soil contamination due to heavy metals from tannery industries: A case study of Jajmau (Kanpur) and Unnao industrial areas, Uttar Pradesh, India

S. SRINIVASA GOWD, N.N. MURTHY AND PRADIP K. GOVIL

National Geophysical Research Institute (NGRI), Hyderabad, India

Environmental geochemical studies were carried out in and around Jajmau (Kanpur) and Unnao industrial areas, to find out the extent of chemical pollution in soil due to waste disposal from tannery industries. There are more than 2500 tanneries in the country and nearly 80% of them are engaged in the chrome tanning process. In Uttar Pradesh, Jajmau (Kanpur) and Unnao ($80^o18'$ – $80^o30'$ E longitude and $26^o25'$ – $26^o34'$ N latitude) are prominent centers for leather processing and there are two clusters of tannery industries (about 450) along the banks of river Ganga. Geologically the study area is covered by alluvium of Quaternary age consisting of older alluvium of middle to upper Pleistocene and newer alluvium of Holocene and the climate of the study area is semi-arid type.

Fifty-three soil samples were collected from Jajmau (Kanpur) and Unnao industrial areas from top 10 cm layer of the soil and were analyzed for heavy metals by using Philips PW 2440 X-ray fluorescence spectrometer. The data reveals that the soil in this area is significantly contaminated, and shows very high concentrations of chromium ranging from 162 to 60819 mg/kg (14535 mg/kg average). Other heavy metals such as Ba ranges 44-781 mg/kg (295.7 mg/kg average), Cu 1.7-126 mg/kg (42.9 mg/kg), Pb 22-68 mg/kg (40.4 mg/kg average), Sr 47-151 mg/kg (105.3 mg/kg average), V 1.3-209 mg/kg (54.4 mg/kg average) and Zn 44-688 mg/kg (159.9 mg/kg average). High concentrations of these toxic/heavy metals are contributors for the degradation of human health in the study area and people suffer from occupational diseases such as asthma, chromium ulcers and skin diseases. Distribution and correlation of heavy metals in soil along with possible remedial measures are discussed.

New constraints on the origin of short-lived radioactive nuclides in the early solar system

GOPALAN SRINIVASAN[1], MARC CHAUSSIDON[2*] AND ADDI BISCHOFF[3]

[1]Department of Geology, University of Toronto, Toronto, ONM5S3BA1, Canada; (srini@geology.utoronto.ca)
[2]CRPG-CNRS, BP20, 54501 Vandoeuvre-lès-Nancy, France; (chocho@crpg.cnrs-nancy.fr)
[3]Institut für Planetology, Wilhelm-Klemm-Strass 10, 48149 Münster, Germany; (bischoa@uni-muenster.de)

The presence of several short-lived radioactive nuclides (^{7}Be, ^{10}Be, ^{26}Al, ^{36}Cl, ^{41}Ca, ^{53}Mn, ^{60}Fe) in the early solar system is established from the presence of their decay products in constituents of primitive meteorites such as Ca-, Al-rich inclusions (CAIs). These nuclides are either (i) the products of stellar nucleosynthesis (as demonstrated by the presence of ^{60}Fe) and were injected in the protosolar cloud before or during its collapse or (ii) the result of interactions of energetic particles (as demonstrated by the presence of ^{10}Be) with gas and dust either in the protosolar nebula or in the presolar cloud. As shown by X-ray observations of young stellar objects, one obvious source of an intense flux of accelerated particles in the protosolar nebula is the young active Sun. CAIs being the oldest solids formed in the solar system, they may have formed close to the young Sun and may contain a record of these irradiation processes. Understanding the origin of short-lived radioactive nuclides is thus fundamental not only for early solar system chronology but also for deciphering the astrophysical context of the formation of the first solids in the early solar system.

We report Li, B and Mg isotopic analyses by ion microprobe (Cameca ims 1270) of a set of various CAIs from the CH chondrite Acfer 182 and CV3 chondrite Efremovka, including some hibonite-rich CAIs which because of their refractory composition are considered to be among the earliest CAIs. The hibonite-rich CAIs have lower $^{26}Al/^{27}Al$ ratios ($<1.1\pm0.5\times10^{-5}$) than the classical type B CAIs from Efremovka (e.g. CAI E66 which has a $^{26}Al/^{27}Al$ ratio of $5.49\pm0.15\times10^{-5}$). The $^{10}Be/^{9}Be$ ratios are lower by a factor of two in hibonite-rich CAIs compared to Efremovka type B CAIs (e.g. $^{10}Be/^{9}Be=1.2\pm0.3\times10^{-3}$ in E65). These data show that ^{26}Al and ^{10}Be are likely decoupled in the early solar system. The low $^{26}Al/^{27}Al$ ratios in hibonite-rich CAIs may reflect the steady state abundance of ^{26}Al in the local interstellar medium. The hibonite-rich CAIs show a systematic slight but significant ^{6}Li enrichment indicative of the presence of a component produced by spallation. This can be used to put a higher limit on the amount of ^{10}Be which could have been produced in the presolar molecular cloud by trapping of galactic cosmic rays.