Potential ecological risk assessment model for heavy metal contamination of agricultural soils

Z.Q. LI[1,3]*, W. LIU[3], D.P. LU[2] AND J.Z. WANG[2]

[1]Department of Geochemistry, Chengdu University of Technology, Chengdu, Sichuan 610059, China (*correspondence: zeqinlee@sohu.com)
[2]Provincial Key Lab. of Neuclear Technology in Geoscience, Chengdu University of Technology, Chengdu, Sichuan 610059, China
[3]State Key Lab. of Geohazard Provention & Geoenvironment Protection, Chengdu University of Technology, Chengdu, Sichuan 610059, China

This work (was to develop a new potential ecological risk assessment model to be used as a diagnostic tool for heavy metals contaminated agricultural soil control purposes. The main-road for ecological risk of heavy metals contaminated soil is soil-vegetation-man. Using environmental bioavailability explains the heavy metals contamination degree of the soil. The model is $E_i^r = C_f^i * T_e^i$. E_i^r = Potential ecological risk index for the metal (*i*); C_f^i= Degree of contamination for the metal (*i*). $C_f^i = (C^i_{bio}/C_o^i)^{1/2}$, C^i_{bio}= soluble fraction + exchangeable fraction [1] of the metal in soil for the samples, which is defined as environmental bioavailability of the metal (*i*) in soil. C_o^i= safe content of the metal (*i*) in vegetation issued by the national government. T_e^i = the element toxic-response factor for the given substance: Zn=1, Pb=5, Cd=15, Cu=2, Cr=11, Ni=3. Based on the 14 soil samples and 14 sweet potato samples correspondingly from contaminated agricultural soil in the vicinity of a Pb-Zn mining district, SW Sichuan Province, table 1 shows correlations between the contents of Cu, Pb, Cd and Zn in sweet potato and P_i (Contamination Degree), I_i (Geoaccumlation index), E^r_i for Cu, Pb, Cd and Zn, respectively. It is very clear that E^r_i by the new model has higher coloration coefcient than both P_i *and* I_i. This demonstrates that the new model is more accurte to response the ecological risk level of heavy metal contaminated agricultural soil.

	Cu		Pb		Cd		Zn
P_{Cu}	0.36	P_{Pb}	0.4	P_{Cd}	0.13	P_{Zn}	0.49
I_{Cu}	0.40	I_{Pb}	0.2	I_{Cd}	0.18	I_{Zn}	0.51
E^r_{Cu}	0.60	E^r_P	0.7	E^r_C	0.71	E^r_{Zn}	0.87

Table 1: Correlations between PTEs contents of sweet potato & P_i, I_i, E^r_i

Support by State Key Lab. of Environmental Geochemistry, China (SKLEG5010).

[1] Tessier *et al*. (1979) *AC*. **51**, 844–850.

Helium isotope composition and its geological significance of the eclogites in the Lasha Terrane, Tibet

ZHAOLI LI, JINGSUI YANG, ZHIQIN XU, TIANFU LI, XIANGZHEN XU AND YUFENG REN

Key Laboratory for Continental Dynamics of MLR, Institute of Geology, Chinese Academy of Geological Sciences, Beijing 100037, China

A new occurrence of eclogites has been discovered in the Lhasa terrane, northeast of Lhasa, Tibet. It is extended along the northern margin of the Gangdese magmatic arc. Different from most formerly found eclogites, which are associated with the subduction of the continental slab, the newly discovered eclogites are associated with the subduction of the oceanic slab. As a result, Lasha eclogites will play an important role in the research of ultrahigh pressure metamorphism and have distinct geological significance.

We use helium isotope tracing technique in this research. Helium composition of Lasha eclogites, isotopic ratios and abundance was present in the paper. The ^{3}He abundance of omphacite and garnet are varied in the range of 2.41×10^{-12}cm^{3}STP/g ~ 9.37×10^{-12}cm^{3}STP/g. The ^{4}He abundance of them are varied in the range of 0.11×10^{-6}cm^{3}STP/g ~ 4.93×10^{-6}cm^{3}STP/g. Compared to the garnet selected from the same sample, the omphacite has relatively higher ^{3}He and ^{4}He abundance than that of the garnet. It suggests that the omphacite and the garnet in the eclogites might have different catching and holding capability for helium isotope.

The ^{3}He/^{4}He ratios of the omphacite and the garnet of the Lasha eclogites are varied in the range of 1.15 ~ 25.48 Ra. They are lower than that of the mantle, and higher than that of the crust. It might indicate a mixed crust-mantle source. This conclusion is in accordance with the results of major elements, trace elements, rare earth elements and Sr-Nd isotopic compositions. It suggests that the newly discovered eclogites should be derived from the depleted mantle, or there must be some mantle-source substance in the diagenesis of the Lasha eclogites.