Regional geochemical mapping of rare and trace elements in northeastern South Korea

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Rare metal has been an indispensable requisite for high-tech industries and thus, various efforts are to put on identifying national natural resources for the continuous development of domestic industry. Early in the 2000s, KIGAM published the national geochemical atlas of 36 major and trace elements for the environmental purpose. However, some rare elements, which are important to advanced industry, were omitted.

Thus, we are now constructing geochemical maps of 16 rare and trace elements (As, Bi, Cd, Cu, Ga, Ge, In, Mo, Pb, Sb, Sn, Ta, Tl, U, W and Zn) in the NE part of South Korea (ca. 14,000 km^2), with the aim of providing the geochemical information to select the prospective area for the domestic development of rare metal resources. Total 3,909 stream sediments (<150 micrometer) were prepared from first- or second-ordered streams with a sampling density of 1 site/ 3.6 km^2. Up to now, about 75% of samples have been analyzed using ICP-MS after a near-total digestion ($HF-HNO_3-HCl-HClO_4$), and the preliminary geochemical maps by Inverse Distance Weighted (IDW) method were produced. Statistical distributions of the elements were asymmetrical with many outliers, excluding Ge and Ga. The high correlationsihps were shown in pairs of W-Mo-Bi, Pb-Zn-Cd and Tl-U, presenting general geochemical associations.

According to the results obtained so far, the distribution pattern of rare elements (especially, U, Tl, Ga etc.) reflected the underlying geology well. The areas of high rare element contents mostly corresponded to the existing metal mines, but some areas did not, implying the potential prospective areas (e.g. new deposits or extension of existing ore bodies).