Creation of database for promising adsorbents for decontamination of radioactive substances from nuclear power plants

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(PhysOrg.com) -- NIMS is collecting basic data on natural minerals produced in various regions and inorganic materials with different chemical compositions as a tool for selecting suitable materials, and will make this information available in a NIMS Materials database (MatNavi).

The search for more effective methods of decontamination of radioactive substances discharged from the Fukushima Daiichi Nuclear Power Plant following the Tohoku Earthquake and Tsunami of March 11, 2011 is an urgent issue. At present, use of natural minerals, beginning with zeolite, as adsorbents is under study as the most promising approach.

In reality, even natural minerals having the same group name possess different adsorption capacities, depending on the chemical composition and original region where the substance was produced. Performance also varies greatly depending on use conditions, such as the concentration of radioactive substances, acidity of the use environment, and the like. In other words, because the most effective adsorbent will vary depending on the use environment, it is necessary to select the optimum adsorbent for the conditions at each site. However, comprehensive data showing the adsorption capacities of the large number of promising materials did not exist anywhere in the world, highlighting the urgent need to create a

database for use when selecting adsorbents.

The National Institute for Materials Science (NIMS) is collecting basic data on natural minerals produced in various regions and inorganic materials with different chemical compositions as a tool for selecting suitable materials, and will make this information available in a NIMS Materials database (MatNavi). The objects are adsorbents for cesium, strontium, and iodine. For the adsorbents under study, NIMS has collected nearly 800 basic data items for 60 species of materials from various localities and with various chemical compositions.

Contamination resulting from the release of radioactive substances affects a wide range of environments. The assumed objects range from contaminated water including seawater which was used to tool the reactor core and is accumulating at the power plant site, contaminated soil in the immediate vicinity of the plant and in the larger region around the plant (rice paddies, fields, orchards, etc.), woods and forests, water, buildings, roadways, and others. The distribution of contaminated water is also extremely diverse, encompassing seawater, river water, ponds and lakes, pools, agricultural water, etc. Because it is necessary to remove radioactive substances from this diverse range of sites, NIMS is performing experiments and collecting data on many types of adsorbents under a wide variety of conditions.

Database construction is being carried out by a total of 7 universities, 4 Independent Administrative Institutions (IAIs), and 1 foundation under Dr. Hirohisa Yamada, Group Leader of the Functional Geomaterials Group, National Institute for Materials Science. In addition to NIMS, the participating organizations are Hokkaido University, Iwate University, Tokyo Institute of Technology, Shimane University, the University of Miyazaki, Tokyo Metropolitan University, Kanazawa Institute of Technology, the Japan International Research Center for Agricultural Sciences (JIRCAS), the National Institute of Advanced Industrial

Science and Technology (AIST), the Japan Atomic Energy Agency (JAEA), and the Central Research Institute of the Electric Power Industry (CRIEPI). These research teams are also key members of the Clay Science Society of Japan.

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