Purifying water with waste materials

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Sand, coral and even waste building materials can become extremely efficient sorbents for removing toxic substances such as arsenic from water if they are treated for that purpose. Scientists of Tomsk Polytechnic University (TPU) have revealed a new technology that purified 3.6 m^3 of water using 200 grams of sorbent from available raw

materials, the cost of which will be a little more $1 to end consumers.

"Arsenic in drinking water is a huge problem for many countries around the world: India, China, the U.S., Argentina, Chile, Poland, Hungary and others. In Russia, arsenic-containing regions include the Trans-Baikal, Khabarovsk, Perm, Stavropol, Magadan, Penza regions, Dagestan and Tuva republics," says the project's scientific supervisor Mikhail Khaskelberg, a leading engineer at the Institute of High Technology Physics, TPU.

"Our technology allows any country to find the cheapest material to produce sorbents. This may be Vietnamese sand, corals, waste from the production of bricks, aerated concrete," he adds.

For the experiments in the laboratory, they used a solution in which the arsenic concentration was up to 50 times higher than the maximum levels set by the World Health Organization.

"Scientists in different countries are studying the same corals and sand as sorbents. But we succeeded in making these simple materials work very effectively, using simple and inexpensive processes in terms of future production," says Khaskelberg.

Thus, the scientists use chemical adsorption resulting in contaminant deposition on the sorbent surface. The laboratory use electro-kinetic adsorption, in which the positively charged heavy metal ions are attracted to the negatively charged surface of a sorbent.

"This technology can be used for purification of private wells and industrial waste water," the scientist said. "According to our calculations, one glass sorbent should be enough for at least 60 to 90 days if there is a catastrophic amount of arsenic in water. Furthermore, our sorbent can be regenerated at least 10 times. A leading Bayer sorbent, Bayoxide E 33,

costs about $27 per kg; our technology costs $ 4 to $5 per kg. It is clear that it is not necessary to fill in a filter with only our sorbent. One needs only some part; the remaining volume can be safely filled with any known sorbent—this provides a high-quality filter with a wide range of applications."

The scientists have already submitted an application for patenting the technology. They are also looking for Russian and foreign investors.

"Despite the fact that the purification of water using sorbents is not a pioneering discovery, the subject is highly relevant. Top international journals have published articles by serious scientists about the properties of known and new materials. And this is understandable—the technology is improved, and problems are solved more elegantly. The basic idea is to develop the cheapest and most effective material. That is why the search continues," adds Khaskelberg.

Provided by Tomsk Polytechnic University