Dutch researcher develops catalysts for clean drinking water

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Jitendra Kumar Chinthaginjala of the University of Twente, The Netherlands, has developed a catalyst that can efficiently remove nitrite and nitrate from drinking water. These two toxic substances are increasingly found in drinking water in areas with intensive agriculture. The catalyst converts nitrite and nitrate, in combination with hydrogen, into harmless nitrogen.

Clean drinking water is a primary necessity of life. In areas with intensive agriculture on sandy soils, such as in Twente in the eastern Netherlands, pollution of groundwater with nitrite and nitrate is a growing problem. Nitrite and nitrate, which are especially hazardous to babies, are difficult to remove from groundwater with current technologies. Jitendra Kumar Chinthaginjala of the University of Twente has now developed a catalyst that can convert nitrite and nitrate, in combination with hydrogen, into nitrogen, which is harmless to humans.

Nitrite and nitrate pollution can currently be kept track of, but because of intensive agriculture a method to remove nitrite and nitrate from drinking water will be needed in five to ten years' time. The new catalyst can be used in treatment plants for drinking water.

The catalyst is composed of a solid substance to which nanoparticles of palladium or platinum are attached. Nitrite or nitrate in combination with hydrogen are converted into nitrogen on the surfaces of these nanoparticles. The use of solid substances as catalysts has the great advantage that the catalysts can be easily removed from the drinking

water.

A problem, however, is that nitrite and nitrate are (fortunately) present in low concentrations in groundwater, and that this concentration has to be lowered until the water is safe to drink. It is difficult to bring the small quantities of nitrite and nitrate into good contact with the surface of the catalysts. Chinthaginjala therefore constructed the catalysts using extremely fine threads of carbon, a thousandth of the thickness of a human hair. The palladium or platinum nanoparticles are attached to these threads. The spaces between the threads allow the nitrite and nitrate to come into good contact with the surfaces of the nanoparticles, with the effect that the catalysts become much more active.

Provided by University of Twente