

From waste to water: Study examines solution to red mud problem

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Scientists at the University of Glasgow are working to turn a toxic industrial waste product into a material which can be used to treat contaminated water.

A team from the University's School of Chemistry, in partnership with The Energy and Resources Institute (TERI) in New Delhi, have found encouraging signs that a substance known as 'red mud' could be carbonized to make it safer. The carbonised red mud could also be used to remove heavy metals from water.

Red mud is a byproduct of the Bayer process, an industrial procedure which extracts alumina from bauxite ore. Alumina, also known as aluminium oxide, is most often used in the industrial production of aluminium. The mud is given its characteristic red colour through its high concentration of iron oxide.

The Bayer process produces around twice as much red mud as alumina, and around 120 million tonnes of red mud are created each year around the world. Red mud is highly alkaline, making it dangerous to handle, and difficult to dispose of. Instead, it is most often kept in large open-air holding ponds. In 2010, one million cubic metres of red mud were accidentally released when a holding pond collapsed near an industrial plant in Ajka, Hungary. In the ensuing flood, which affected 40 square kilometers of countryside, nine people were killed and more than 120 were injured.

Dr. Justin Hargreaves, Senior Lecturer in Chemistry at the University of Glasgow, said: “We’ve been working our partners in India since 2008 to examine ways in which red mud could be treated to make it safer. We’ve also found that this dangerous waste material could be reconfigured to be used to remove metals such as lead and copper from water.

“By using samples of red mud as a catalyst to crack methane, which liberates hydrogen, we’ve succeeded in reducing the iron oxide in the mud to iron metal or iron carbide which are coated with carbon. This material is magnetic, so when it is added to water contaminated with metals, it can be used to attract the contaminants and remove them from the water.

“The carbonization process also reduces the pH of the mud much more effectively than current methods, which usually involve adding acid to the mud. This makes the carbonized red mud much less caustic and therefore less of a handling hazard.

“The material we’ve been working with has only been a few grams at a time, and we don’t know whether this process can be reproduced on a large scale. The chemical composition of red mud can vary greatly from source to source, which means it’s hard to make any definitive statements at this early stage. We’re still some way away from scaling the process up to industrial levels but we’re keen to further explore the possibilities we’ve uncovered.”

The research has been supported with funding from the British Council’s UK-India Education and Research Initiative (UKIERI).

A new paper, entitled ‘Carbonized [red mud](#) – A new water treatment product made from a waste material’, will be published in the June 2012 edition of the *Journal of Environmental Management*.

Provided by University of Glasgow

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