'Poisoning' corrosion brings stainless magnesium closer

August 19 2013

Credit: AI-generated image (disclaimer)

(Phys.org) —In a discovery that could have major implications for the aerospace, automotive and electronics industries, scientists have found a way to dramatically reduce the corrosion rate of lightweight wonder metal magnesium: adding arsenic.

Weighing in at two thirds less than aluminium, magnesium is the lightest structural metal. It has many potential industrial applications, but uptake is severely restricted by its poor resistance to corrosion. Identification of methods to restrict magnesium corrosion is the first step in engineering such technology into functional alloys.

For the first time, a group of researchers, led by Monash University's Associate Professor Nick Birbilis, have created a magnesium alloy with significantly reduced corrosion rates by adding a cathodic 'poison' - arsenic.

They found that the addition of very low levels of arsenic to magnesium retards the corrosion reaction by effectively 'poisoning' the reaction before it can complete.

Once magnesium is available in a more stainless, or corrosion-resistant, form wider use will lead to significant weight and energy savings in transportation industries. It has been the subject of significant research efforts concentrating on developing light metals.

Associate Professor Birbilis, of the Monash Department of Materials Engineering, said the discovery would contribute to the birth of more 'stainless' magnesium products by exploiting cathodic poisons.

"This is a very important and timely finding. In an era of light-weighting for energy and emissions reductions, there is a great demand for magnesium alloys in everything from portable electronics to air and land transportation," Associate Professor Birbilis said.

"Magnesium products are rapidly evolving to meet the demands of industry, but presently are hindered by high corrosion rates. The arsenic effect we discovered is now being trialled as a functional additive to existing commercial alloys.

"Our breakthrough will help develop the next generation of magnesium products, which must be more stainless."

The research, conducted with the University of Wales and CSIRO, is published in the journal *Electrochemistry Communications*.

More information: www.sciencedirect.com/science/ … ii/S1388248113002804

Provided by Monash University