Tohoku Univ. Technology

Mg alloy that generates hydrogen inside neutral aqueous solution

Alloy that does not stop reaction during the process and continues to produce only hydrogen

Overview

Hydrogen is attracting attention as a sustainable energy source, but all current hydrogen generation methods, such as water electrolysis or steam reforming of fossil fuel, have an important environmental impact. The "hydrolysis" which generates hydrogen by reacting metallic material with water, is attracting attention as a hydrogen generation method with a small environmental impact. The advantage of the hydrolysis is that it does not generate oxygen but only hydrogen, so the oxygen separation process is not necessary and there is no risk of explosion.

Hydrogen generating materials consisting of Mg or Mg alloy have been reported as material for hydrolysis, but the phase which does not react with water such as $Mg(OH)_2$ is formed and the reaction stops in the middle of the reaction process. Therefore, most of the previously reported hydrogen generating materials have a small hydrogen generation per unit weight.

This invention is about the hydrogen generating alloy that does not stop reaction even inside neutral aqueous solution. This alloy generates a large amount of hydrogen per unit weight because it reacts with water until the end without stopping the reaction in the middle. Moreover, the alloy is composed only of Mg and Ca elements, which are present in large quantity on Earth and are not toxic to the ecosystem. There are very few hydrogen generating materials that do not generate heavy metal ions through hydrolysis, and this alloy has potential to use in any location.

Features･Outstandings

Fig. 1 Hydrogen generation

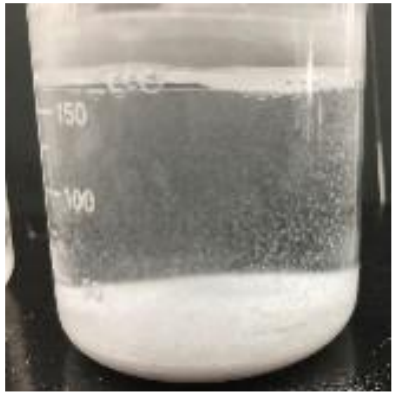

Fig.2 Residue after reaction

1000L hydrogen generation
→ Approximately 1.2 kg of alloy + 1.4L of water consumption
*No oxygen generation at all

Product Application

- Hydrogen gas production method without oxygen generation
- Anode material for battery (fuel cell, air battery, seawater battery)
- Science teaching material without acidic solution

Related Works

[1] Journal of Alloys and Compounds 919 (2022) 165767.

IP Data

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