Nanogalvanic Aluminum Powder For Hydrogen Generation

Technology Description – The U.S. Army Research Laboratory (ARL) developed a novel, structurally-stable, aluminum-based nanogalvanic alloy powder that, when combined with water or any water-based liquid, reacts to produce on-demand hydrogen for power generation without a catalyst. This powder-based alloy includes material that disrupts the formation of an encapsulating aluminum oxide layer, allowing for the continuous production of hydrogen that can be used at the point of need to power a wide range of devices via fuel cells and internal combustion. The powder can be easily manufactured to scale, and can be conveniently and safely transported via tablets or vacuum pouches, thus eliminating reliance on high-pressure hydrogen cylinders.

- **Energy & Power Source**
- **Stable Alloy Powder**
- **Non-Toxic**
- **Environmentally Friendly**
- **Hydrogen Emitting**
- **Manufacture to Scale**
- **Easily Transportable**

Potential Market Segments –

- Powder manufacturers
- Fuel cell producers
- Fuel cell consumers
- Hydrogen power producers and consumers
- 3D printing/ Additive Manufacturing
- Military

Intellectual Property –

- USPTO Provisional Patent Application 62/536,143

Development Status –

- Ongoing testing and evaluation.
- Non-Provisional patent to be submitted Summer 2018

Licensing & Collaboration Opportunities/Availability – ARL anticipates publishing a Request for Information (RFI) inviting companies to submit their ideas on how best to commercialize this technology. ARL will then select the most appropriate partners/collaborators. License exclusivity is to be determined.

Benefits/Applications –

- Simple Manufacturing – powder can be made using current manufacturing techniques from either pure or alloyed aluminum for manufacturing other powders; manufacturing process is easily scalable
- Fast – 75% theoretical hydrogen yield in 1 minute at standard temperature and pressure, and 100% theoretical yield in 3 minutes
- Efficient – 1kg of powder can generate 4.4kWh of energy – enough to power 10 60W incandescent light bulbs for over 7 hour or the equivalent LED bulbs for over 50 hours or fully charge 300 iPhones
- Convenient – material in powder or tablet form can be combined with any available water-based liquid to provide hydrogen on demand, at the point of need
- Safe – eliminates reliance on high-pressure cylinders; easy to transport and store via tablets or vacuum-sealed pouches; no inherent inhalation risk
- Environmentally friendly – by-products are stable and non-toxic
- Versatile hydrogen source – direct combustion for vehicular power, to utilization in fuel cells to power any electronic device, and could potentially be used in 3D printing/additive manufacturing to create self-cannibalizing robots/drones

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