WHAT'S NEW?

Now In The XP Development Lab -

- *An atomic reactor in your pocket that has no radiation issues?* **Betavoltaic devices**, also known as **betavoltaic cells**, are generators of electric current, in effect a form of battery, which use energy from a radioactive source emitting beta particles (electrons). A common source used is the hydrogen isotope, tritium. Unlike most nuclear power sources, which use nuclear radiation to generate heat, which then is used to generate electricity (thermoelectric and thermionic sources), betavoltaics use a non-thermal conversion process; converting the electron-hole pairs produced by the ionization trail of beta particles traversing a semiconductor.[1] Betavoltaic power sources (and the related technology of alphavoltaic power sources[2]) are particularly well-suited to low-power electrical applications where long life of the energy source is needed. One of the projects in our research delivers a hydrogen flow for fuel cells simply by adding water. Analytical lab simulation and real-world testing prove that such systems can deliver energy from water for tactical field operations for over a year at a time per cassette.

- *Solar power may be useful for making hydrogen to power automobiles*. Car companies around the world are working on electric cars that get their electricity from hydrogen fuel cells. The technology is appealing because fuel cells have only two byproducts — water vapor and heat. In fact, Honda plans to capture some of that water vapor and use it to humidify the interior of its upcoming Clarity fuel cell car that is scheduled to go on sale later this year. a technique that uses solar power to produce clean hydrogen from biomass. The new technique involves the addition of catalytic nanoparticles to alkaline water containing biomass. The solution was put in front of a lab based light that mimics sunlight. The result was that some of the biomass was turned into hydrogen gas. There's a lot of chemical energy stored in raw biomass, but it's unrefined, so you can't expect it to work in complicated machinery, such as a car engine. One system is able to convert the long, messy structures that make up biomass into hydrogen gas,

which is much more useful. Specifically designing a combination of catalyst and chemical solution that allows this transformation to occur using sunlight as a source of energy is ideal. With this in place one can simply add organic matter to the system and then, provided it's a sunny day, produce hydrogen fuel.

- *Work with partner manufacturers to volume produce* self-contained solar-to-hydrogen devices made up of billions of solar powered water-splitting nanoparticles, per square centimeter. These nanoparticles are coated with a separate glass-like protective coating that prevents corrosion during extended periods of hydrogen production. The aim of these nanoparticles is high conversion efficiency and low cost. An important aspect of the technology is the integrated structures of high-density arrays of nano-sized solar cells as part of hydrogen production nanoparticles. The technology targets manufacturing of ultra-thin sheets for solar-to-hydrogen production, requiring substantially less material as compared to conventional solar cells used in rooftop power applications.

- *Partner research teams tackled a renewable hydrogen bottleneck* involving the catalyst that is needed to split water. There are only 16 known "photoanode" materials that can jumpstart the chemical reaction that produces hydrogen from water. Researchers spent 40 years developing that stable of 16. In just two years, associated team almost doubled that number with the addition of 12 new photoanodes. Making energy from water has now become far, far easier and more efficient.

- *A low voltage/high-efficiency power source* sends an electric current through two electrodes that split liquid water into hydrogen and oxygen gas. Unlike other water splitters that use precious-metal catalysts, the electrodes in a new device are made of inexpensive and abundant nickel and iron. Using nickel and iron, which are cheap materials, one is able to make the electrocatalysts active enough to split water at room temperature with a single micro battery, solar panel or free harvested energy source. This is the first time anyone has used non-precious metal catalysts to split water at a voltage that low. It's quite remarkable, because normally you need expensive metals, like platinum or iridium, to achieve that voltage.

- *A diesel fuel cell system you can fill up at any corner has station…* New fuel cells combine the benefits of two main types of fuel cells: Polymer-electrolyte-membrane fuel cells and solid-oxide cells. Polymer-electrolyte-membrane fuel cells, the type GM and other car companies use in their fuel-cell vehicles, are convenient because they run at low temperatures. But at these low temperatures, carbon monoxide can collect on catalysts and prevent them from doing their job. This requires them to use purified hydrogen fuel, which isn't widely available. The new solid-acid fuel cells can run at higher temperatures (250 °C instead of 90 °C) at which carbon monoxide isn't a problem, so they can run on hydrogen made on the spot from natural gas and diesel, which is far more readily available than hydrogen. Our diesel fuel power plant uses ordinary diesel fuel to provide long lasting, silent, diesel to electric power.

Update 1.2