Companies to Watch

SiGNa Chemistry

[private]

www.signachem.com

New York, NY

Chief Executive: Michael Lefenfeld

What it does: Stable alkali metal reagents for chemical reactivity and hydrogen production

What started as a project to develop a better toilet bowl cleaner produced a revolutionary way to use alkali metals. From pharmaceuticals to petrochemicals to hydrogen production, alkali metals have numerous potential applications; but only if there is a way to maintain their reactivity, while making them easy to transport and handle. Under normal conditions, they explode or catch fire in open air and in water.

By ionizing the metals inside a porous oxide (silica gel or alumina), SiGNa came up with an efficient method of encapsulating the loose valence electron that makes these metals so unstable. What remains is an alkali metal oxide that is just as strong and reactive, but much safer in the open. With less volatility, there is less danger in shipping, storing and using the metals, thus lowering the associated costs.

The pharmaceutical industry is one of the first to benefit directly from SiGNa's products. While alkali metals are used in the early stages of drug development to manipulate the chemicals into the products being synthesized, they are not used in actual production due to their volatility. Replacing the use of the alkalis requires the design of a multiple step process, driving costs higher. With SiGNa's reagents, there is no need to replace the usage of the alkali metals, lowering the development and production costs.

SiGNa is also shining a whole new light on an already bright technology: hydrogen fuel cells. A fuel cell consumes hydrogen and produces clean water as its only by-product. Sounds great, right? Two small problems: safely transferring hydrogen to the cell and efficiently storing it once it's there. One derivation of the alkali metal-oxides SiGNa produces is benign in open air, but as soon as it comes in contact with water, it reacts and produces pure hydrogen gas. This process requires no catalyst, unlike the current borohydride fuel cell systems in development. SiGNa is currently working with a number of fuel cell manufacturers to integrate this technology. Who knows, one day we might be fueling our cars with a box of powder from SiGNa and a garden hose.

SiGNa could also benefit the petroleum industry. Petrochemicals, specifically polymers, are generally constructed through anionic polymerization (adding an electron). Unfortunately, this is a complex process that requires working with very dangerous elements. SiGNa's products maintain the reactivity needed to be effective, but in a much safer environment. This technology can also be used to pull impurities from crude oil. SiGNa's products have proven highly efficient in cleansing petroleum of sulfur and other agents.

Founded only eighteen months ago, SiGNa projects revenue of $100,000 by year-end, and its customer base is a who's who of the global economy. Purchase orders have come in from **ExxonMobil** [XOM], **Shell Chemical** [RD] and **Pfizer** [PFE]. **DuPont** [DD], SiGNa's supplier of alkali metals, and **BASF** [BF] have also established working relationships with Lefenfeld and his team. **Sigma-Aldrich** [SIAL] is distributing SiGNa's products to research groups around the world, and using it for their own internal research.

Starfire Systems Inc.

[private]

www.starfiresystems.com **(518) 899-9336**

Malta, New York

Chief Executive: Richard Saburro

What it does: Building better brakes with nanotech silicon carbide ceramics

Onboard Space Shuttle Discovery is a repair kit that consists of ceramic patches and a sealing paste that can withstand temperatures of 3,000 degrees. Starfire produced the polymers used in the paste, which was developed by **Alliant Techsystems** [ATK]. It is one of three applications astronauts will test for repairing any holes in the spacecraft's heat shield while still in orbit.

Founded in 1988, Starfire commercialized a process that transforms polymers into a highly heat and wear resistant ceramic material. The company's first product, a motorcycle brake rotor, is reportedly 75% lighter than current products and offers longer life with little or no performance fade. Starfire also sells automotive brake pads and rotors, but hopes that its process and the materials it can produce will have wider applications in electronics, coatings, auto emissions control, and aerospace.

Advanced ceramics have historically been inhibited by high cost, performance barriers, purity problems, and manufacturing difficulties that limited the size or shape of applications. Starfire believes that its approach for producing nano-structured ceramics is easier, cleaner and more flexible than existing techniques, and can scale with demand.

Starfire has built a better brake, and that may be enough to keep it moving forward, but in the long run the company needs to prove that it's more than nifty niche player. The company reports "customer relationships" with 49 firms that should produce revenues near $5 million in 2005 (up from $3 million in 2004). Depending on its ability to scale production, Starfire projects to break even early in 2007 and to quadruple sales to $20 million.

Starfire received $500,000 in follow-on money from **Harris & Harris Group** [TINY] in March of 2005 after a $1 million investment by TINY in 2004. Starfire says that it has received $12 million in total funding and government grants since inception. Not surprisingly, it expects to go public or to be acquired in the next three years.

Its prospects seem promising. The company was awarded a recent patent for filtering particles in diesel engine emissions with its polymer matrix ceramics. It holds two other patents and has filed ten other applications.

Starfire is beginning to beta test its materials as substrates for electronics packaging, and is considering electronics applications including high-temperature chip fabrication. It sells its polymers as precursors for various uses in chemical vapor deposition of high-tech films and coatings.

Its work for NASA could go beyond Space Shuttle patching. The agency said in a 2003 letter that the company's nano-ceramic materials have the potential to impact high-temperature, high-strength applications at NASA, such as the "scramjet" engine in a proposed hypersonic aircraft, which requires materials that can withstand a 2,300-degree operating environment.

Starfire counts Tomoe Corp. in Japan as a distributor, and has reportedly signed a letter of intent with a major brake supplier. Also, the company has disclosed that it is in talks with a leading European chemicals and materials company about a strategic partnership. **BASF** [BF], Degussa and **Bayer** [BAY] are three names that come to mind.