



The Magic of The Strongest Material – Carbon Nanotubes Overview of Zyvex Performance Materials (ZPM) Business

Abstract:

Carbon nanotubes (CNTs), known to be the strongest material, possess many excellent properties including high thermal and electrical conductivity, high tensile strength and modulus, and rapid absorption of infrared and microwave energy. When incorporated to a polymer matrix together with carbon fibers, the composite strength and stiffness can be increased by 40% and 50%, respectively. This new composite can be very useful for sporting goods, military, marine, aviation, automotive and other structural applications. Zyvex Performance Materials (ZPM) is a world leader in commercializing CNTs via its branded products Arovex™, Epovex™, and Epovex Adhesive™. ZPM has been working with a number of sporting goods companies to develop stronger and lighter bicycle parts, more durable baseball bats, and numerous other products. ZPM is also working closely with other partners to provide application development solutions and is currently engaged in new development involving thermosets, thermoplastics, and elastomers.

On September 24, 2009 NanoGlobe together with Singapore Manufacturers' Federation (SMA) and Singapore Business Federation (SBF) organized a seminar to introduce a USA company, Zyvex Performance Materials (ZPM), to the Singapore business and industry community. It was attended by over 40 industrial and academic players. The talk was delivered by Mr. Jim Von Ehr, a nanotechnology visionary, engineer, and investor and the founder of ZPM. Jim has been in nanotechnology business since 1996 and he is the largest private investor in nanotechnology so far (USD 60M invested in seven companies).

ZPM is based in Ohio, USA with about 20 staff. It is a world leader in commercializing carbon nanotubes (CNTs), focusing on mechanical properties of CNTs. ZPM's vision is to create the ultimate performance materials that enable their customers to achieve superior results

ZPM impregnates CNTs into a carbon-fiber-reinforced polymer composite to act as a strengthening agent to the resin matrix for better load transfer and toughness. Three primary challenges normally present in composite technology include the need to produce good dispersion of the CNTs, good binding of the CNTs with the matrix, and good compatibility of the CNTs to the matrix. Through their development work, ZPM is able to increase the strength and stiffness of the composite by 40% and

50%, respectively. The composite can then be applied for structural solutions in automotive, marine, transportation, aviation, defence, sporting goods, and other applications.

ZPM's product line offers lighter weight and mechanical properties improvement, such as strength, toughness, and impact resistance. These lead to customer benefits such as fuel efficiency and reduced carbon emissions, with a prime example being a boat under development which will weigh about 4500kg compared with the weight of over 18,000kg using conventional materials. Fuel economy and performance jump proportionately, with the ZPM boat getting fuel economy of 15 gallons/hour compared with 85 gallons/hour for the conventional boat. The business model ZPM adopts is application development using its branded products, with a leveraged model of using supply chain partners for manufacturing scale up. It promises cost competitive products, although they are not aimed at commodity markets.

ZPM currently sells three branded products: Epovex™, an enhanced epoxy, Arovex™, an enhanced carbon fiber prepreg, and Epovex Adhesive™, an enhanced adhesive for use with any carbon fiber prepreg. ZPM also sells a CNT dispersion in water/solvent for customized usage and applications.

The partners ZPM has been working with range from raw material suppliers and manufacturers to distributors of the applied products, including Easton Sports for sporting goods application such as bicycle parts and baseball bats, Aldila for its golf clubs, Insect Skateboards, Lockheed Martin, PolyOne, Arkema, DARPA, and NASA. ZPM's major outside investors are Arkema, a major French chemical company and supplier of ZPM's CNTs, and Lockheed Martin.

At present, ZPM is seeking collaborations for new application development of new polymer systems such as thermoplastics, thermosets and elastomers, for CNTs, nanographene and other nanomaterials. More details about ZPM can be found at www.zyvexpro.com and details about Zyvex at www.zyvex.com.



Jim Von Ehr presented the capabilities of ZyveX Performance Materials (ZPM)



Application examples of ZPM's products