nanoMAG LLC Wins New NSF Funding For Development of Bioabsorbable Orthopaedic Implants Made of High-Strength Magnesium Alloys

LIVONIA, Mich. – nanoMAG LLC, Livonia, Mich., the developer of novel lightweight, high-strength magnesium alloy technology, has been awarded new funding from the National Science Foundation (NSF) for further research and application development of its unique material. A contract extension with the NSF will support research work on bioabsorbable biomedical implants for orthopaedic applications. nanoMAG LLC, a subsidiary of Thixomat Technologies LLC, made the announcement from their new manufacturing facility in Livonia, Mich.

"Were encouraged by the continued support weve received from the NSF as we take the next major step toward commercialization of our new nanoMAG™ technology in biomedical fields," said Stephen LeBeau, president of nanoMAG. "We are very excited to continue working closely with a major orthopaedic supplier developing nanostructured magnesium alloys of exceptional strength/density and specialty chemical compositions for tailoring to optimum biodegradation rates, while maintaining biocompatibility.

Under the new grant, the upcoming animal testing will be performed in collaboration with the NSF Engineering Research Center for Revolutionizing Metallic Biomaterials (ERC-RMB) as a small business innovation partner. The ERC-RMB, headquartered at North Carolina A&T State University (NCAT), Greensboro, N.C., will receive $25 million from the NSF and the state of North Carolina over the next five years to establish a major center for multi-disciplinary research and development for metallic biomaterial implants. This research is being conducted at four major universities including NCAT, University of Pittsburgh, University of Cincinnati, and the Hannover Medical School in Germany.

The nanoMAG strategy is to partner with industry leading biomedical implant makers to design and develop metallic implants to be bioabsorbable, according to LeBeau. These implants are developed using proprietary alloys of magnesium and other compatible elements which provide the appropriate strength and bone support while healing occurs, after which the implant dissolves and is absorbed by the body. The manufacturing process is a miniature version of the larger industrial molding machines that over 50 Thixomat licensees use today to produce millions of consumer parts per year.

The quality of patient care available with current orthopaedic medical implants is limited by the properties of the structural materials used in their design and construction. According to LeBeau, biomedical device practitioners seek tailor-made

materials that can be produced in closely tracked lots with consistent quality and exacting properties to match the application. With state-of-the-art plastic absorbable implants, there is a gap in obtaining hardness levels sufficient for structural support and for rugged fixation into the bone. The lower mechanical properties and hardness of todays plastic implants limit their use to smaller fixations or reconstructive surgeries. In addition, LeBeau noted that plastics can leave an acidic local environment which retards bone reconstruction. Current metal implants that use materials such as titanium or cobalt solve the problems of low strength and hardness, but are not bioabsorbable. For durable metal implants which must be removed after the bone heals, or in the case of pediatric patients who outgrow their implants, a secondary surgical procedure is required which is both costly and involves additional risks and pain for the patient.

nanoMAG offers a bio-absorbable magnesium alloy which is strong and can be reabsorbed, thus offering a source of nutrients for bone regrowth. nanoMAG magnesium alloy also offers a stiffness level close to that of bone. nanoMAG has created an alloy containing elements that are naturally found in the body and incorporate a design that appropriately controls the rate of dissolution. As a result, the implant can supply the necessary temporary structural reinforcement while avoiding the complications associated with current permanent metal alloy implants, says LeBeau. Magnesium is a naturally occurring element in the body and is in fact prescribed in combination with calcium and phosphorus in numerous supplemental vitamins to help maintain bone strength.

According to nanoMAG, magnesium alloy implants are designed to be strong and dissolve over months as the bone recovers its original strength. The density and strength of the nanoMAG magnesium material resembles human bone more than other currently popular implant materials such as plastics or competitive metals. nanoMAG partners have suggested applications such as screws, staples, tacks, wire, rods, plates, and 3D shapes for ligament fixations, craniofacial implants, and small bone implants . "These new magnesium parts could radically change how orthopaedic implants are made and used," said LeBeau.

The overall market for orthopaedic implants is $37 billion worldwide (2010 estimate) with $14 billion for reconstruction devices and $4 billion for trauma fixation devices. Approximately 60% of the market is U.S. based and growth is estimated at 12%-13% per year.

Strong growth is seen in craniofacial repairs including jaw and facial reconstruction as well as dental implants (15%) and small bone implants (12%) driven by new innovative solutions. The market size for small bone and craniofacial repairs is estimated to be approximately 1.8 to 2 million procedures per year with a total value of $4.3 billion.

nanoMAGs business plan is to align with strategic industry partners. The company will provide expertise in magnesium alloy design and fabrication. The OEM customer will then take the product through early animal validation studies, FDA regulatory approval, and ultimately to market and distribution. nanoMAG will be a value- added supplier of medical implants with unique chemical composition and structural

characteristics to meet specific surgical procedures and patient requirements. The strategic partner will be responsible for sterilization and packaging for shipment to the market.

nanoMAG is actively seeking development partners to test and validate early pre-production samples tailored to end-use markets.

About nanoMAG LLC
nanoMAG LLC, based in Livonia, Mich., is a subsidiary of Thixomat Technologies LLC, a company with more than 20 years of experience in the research, development, and marketing of technologies for the production of products utilizing magnesium alloys. nanoMAG supplies precision magnesium sheet and short-run specialty alloys to diverse industries including automotive, aerospace, biomedical, and military. nanoMAG magnesium sheet provides 100% higher strength and improved toughness over conventional magnesium, while also providing the strength of carbon steel sheet at one-fourth the weight. For more information, visit www.nanoMAG.us [1].

About Thixomat Inc.
Thixomat Inc., based in Livonia, Mich., is the developer of the Thixomolding® process which produces injection molded products from magnesium stock. The process permits the manufacture of net or near-net shape parts requiring little finishing. There are more than 50 Thixomat licensees and more than 400 Thixomolding® machines have been sold worldwide. More information is available at www.thixomat.com [2].

Posted by Sean Fenske, Editor-in-Chief, MDT

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