MesoCoat

Privately Held

Nanocomposite ceramic-metallic coatings and metal cladding technology

Updated: June 20, 2011

Newer update available!

What you need to know

- Develops nanocomposite ceramic-metallic coatings and metal claddings with properties such as anti-wear, anti-corrosion, and low friction
- PComP coatings are made from non-oxide ceramic and metallic nanoparticles and applied using a thermal spray-deposition process
- CermaClad is a corrosion- and wear-resistant alloy cladding technology; the process was licensed from Oak Ridge National Laboratory
- Targeting aerospace, defense, mining, shipbuilding, and oil and gas industries; $1.7 million cooperative agreement with Petrobras is most notable deal to date
- Began construction of new manufacturing facility in April 2011; plans to raise $50 million over next two years for building five additional production facilities
- Interested clients should test price-performance benefit of CermaClad, but wait until PComP development is more mature before sampling this product line

luxtake: positive

Scorecard

Name	Score	Comment
Technology/solution value	4	Coatings and claddings improve wear and corrosion resistance, at potentially lower cost; company currently scaling up so costs at scale still uncertain
Addressable market size	4	Targeting aerospace, defense, mining, shipbuilding, and oil and gas markets, totaling billions of dollars in opportunity
Competitive landscape	2	Anti-wear and anti-corrosion coatings targeted by many large corporations and start-ups; CermaClad process could set apart in mature CRA cladding space
Barriers to growth	3	Maintaining performance and lowering costs during scale-up will be crucial; long qualification timelines in aerospace and oil and gas will likely slow progress
IP position	3	14 total patents, nine of which are licensed from Powdermet and U.S. DOE; overall nanomaterial-based coatings landscape is dense
Regulatory factors	4	Federal regulations to replace chrome in various applications stand to drive adoption; nanoparticle safety worries affect some uses
Management team	3	Wisely focused on specific applications; between investor Abakan and MesoCoat management there is significant experience in technology commercialization
Partnerships	3	Deal with Petrobras is significant; JDAs and partnerships turning into commercial customers will be critical
Momentum	4	Significant progress over last year includes Petrobras deal, partnerships with two other major corporate entities, and construction of manufacturing facility
Other	3	Plans to raise an additional $50 million over the next two years and build five more cladding plants around the globe over the next three years

Ratings are on a 1 to 5 scale from 1 (very unfavorable) to 5 (very favorable). For full scorecard explanations, view this profile online at portal.luxresearchinc.com.

Key Metrics

Name	Category	Value	Date	Comments
Cost	coatings	$30-$10,000/m2	June 20, 2011	For CermaClad, depends on cladding thickness: 3 mil Al costs $30/m2; 3 mm Ni alloy costs $5000/m2; and 8 mm Ni alloy costs $10,000/m2
Cost	coatings	*$775-$7,750/m2*	June 20, 2011	For 7 mil PComP coating; Andrew claimed chrome coatings cost about $0.50 per square inch and tungsten carbide coatings cost up to $5 per square inch and that PComP costs in-between those limits
Production capacity	coatings	*5,819-37,755 m2/yr*	June 20, 2011	For CermaClad; Andrew said current CermaClad line is for qualification but if dedicated to production could produce five to seven miles a year of 3 mm to 7 mm thick cladding; pipe diameter may range from 8" to 42" OD

Name	Category	Value	Date	Comments
Production capacity	coatings	645 m2/yr	June 20, 2011	For PComP; Andrew said a production cell can coat 1 million square inches per year on average

Italics indicate Lux Research estimated value

History

MesoCoat was formed in 2007 as a spin-out of specialty materials provider Powdermet in order to commercialize the company's advanced coatings. Since then, the publicly traded holding company Abakan has been the dominant investor - leading a $1.4 million Series A round in December 2009 and a $2.8 million Series B that Andrew claimed will shortly be closed.

Technology

MesoCoat develops nanocomposite ceramic-metallic coatings and metal claddings with properties such as anti-wear, anti-corrosion, and low-friction. It makes the coatings from non-oxide ceramic and metallic nanoparticles (metal nitrides, carbides, and sulfides) 100 nm to 500 nm in size, coated with metals like cobalt or nickel. MesoCoat calls this material Particulate Composite Powders, or PComP (see the July_19,_2010_LRMJ). It applies the PComP coatings using a thermal spray deposition process, and divides them into three major offerings: PComP S, a corrosion resistant silicon-nitride-based hard chrome replacement material that is lightweight and geared for aerospace and other transportation markets where fuel economy is a prime focus; PComP T, a titanium-based hard chrome replacement material for non-aerospace applications like oil and gas and mining where wear and corrosion resistance are key; and PComP W, a tungsten-carbide-based material with extreme wear and corrosion resistance geared for oil and gas (O&G) downhole bearing and mining applications.

MesoCoat's other major product line is a metallurgically bonded corrosion- and wear-resistant alloy (CRA and WRA) cladding technology licensed from Oak Ridge National Laboratory (ORNL), dubbed CermaClad, that uses a high-density infrared arc lamp to rapidly fuse a uniform layer of metal powder to a target substrate. Andrew claimed the process has 40 times faster throughput than traditional weld cladding and offers better metallurgical properties.

Strategy and markets

MesoCoat's business model for PComP is to provide component refurbishing services to original equipment manufacturers (OEMs) and maintenance and repair organizations (MROs) in the aerospace, defense, mining, and oil and gas industries. For CermaClad, MesoCoat is initially targeting the oil and gas, mining, and shipbuilding markets; here it buys steel pipe and plates from suppliers and applies the cladding in-house. MesoCoat's most notable deal to date is $1.7 million in cooperative agreement funding from Petrobras to develop CRA-clad pipe to be deployed for infield flow lines, water return lines and caternary risers. Additionally, Andrew said the company will soon announce a joint development agreement with a major manufacturer of mining and construction equipment, and a partnership with one of the world's largest suppliers of drillpipe (Andrew revealed the names of these two companies but did not want them publicly disclosed). The U.S. Air Force is qualifying its PComP coatings for aerospace landing gear applications, and MesoCoat has also formed a collaborative agreement with the University of Akron to use its CermaClad products to combat corrosion in energy generation, infrastructure, and transportation. MesoCoat also recently signed an exclusive supply agreement with Mattson Technology that grants MesoCoat access to Mattson's ultra-high intensity arc lamps.

In April of this year, MesoCoat began construction of a new 11,000 ft2 manufacturing facility in Euclid, Ohio, that will house a 10,000 m2/year CermaClad production line and a thermal spray system for commercializing PComP products (see the April_11,_2011_LRMJ). Andrew said the company plans to raise an additional $50 million over the next two years for building five additional production facilities. Andrew noted that MesoCoat's growth projections have CermaClad and PComP accounting for 80% and 20% respectively of future revenues.

Key Issues

Key Issue: Price of oil

What they said	What we think
Andrew said the profitability and ultimate commercial success of MesoCoat's cladding product is highly dependent on the price of oil. His goal is for CermaClad not only to replace conventional cladding processes - such as laser cladding, weld overlay, explosion cladding, and mechanical cladding - but also to enable cladding in areas where it has heretofore been limited.	Andrew is correct that the price of oil will be a key driver for adoption and commercial penetration. Remaining oil reserves are increasingly found in deeper, harsher, and more remote locations, meaning that the oil and gas industry will require advanced materials to protect operating equipment utilized in these conditions (see the report __"Tapping_the_Advanced_Materials_Reservoir:_Coatings,_Composites,_and_Additives_in_Oil_and_Gas"). A metal cladding like Mesocoat's CRA is one of the best options for protecting drillpipe and production tubulars in extreme corrosion and wear environments. Solutions that extend equipment lifetime and minimize workover - restorative operations performed on a well to maintain or improve production - can provide a lifetime economic benefit even if initial costs are high. However, several of the operating companies we've spoken with admit they often focus too much on upfront costs rather than comprehensive lifecycle analyses, and thus a crude oil selling price of $100/barrel vs. $70/barrel could be the difference in considering a novel material technology. Moreover, the inherent volatility in the price of oil is a risk factor that could dissuade potential customers from signing long term contracts.

Key Issue: Thermal spray vs. electroplating

What they said	What we think
Andrew said electroplating processes have a lower capital investment than thermal spray deposition and are not limited to simple shapes, but have a higher recurring environmental cost due to contaminated wastewater streams. He also claimed that thermal spray allows for a higher ceramic content in the resulting coating than electroplating.	While the ability to incorporate higher ceramic content should enhance wear and corrosion resistance, thus far the developers pursuing electroplating (such as Integran, Modumetal, and Xtalic) have seen far greater commercial success than their thermal spray counterparts (see Inframat in addition to MesoCoat). Lower upfront costs are a significant advantage when dealing with oil and gas companies and are likely a significant contributing factor for higher commercial traction. MesoCoat is wise to focus more on its CermaClad product rather than PComP because claddings represent a different protective material class meant for extremes of wear and corrosion, while the thermal spray and electrodeposition coatings are more similar in terms of function and the cheaper alternative is likely to win out.

Vital Stats

Statistic	Value	Date	Comment
Employees	21	Apr 2011	Andrew said there are an additional 15 positions open that he is currently trying to fill
Revenue	$1.2 million	2010	
Cash	$2 million	Apr 2011	
Profitable	No	Apr 2011	Andrew expects the company to become profitable in 2012 or 2013

Italics indicate Lux Research estimated value

Key relationships

Partner	Type	Importance	Comment
U.S. Air Force	Development partner	Minor	
University of Akron	Development partner	Minor	
Powdermet	Investor	Minor	
Petrobras	Development partner	Major	
Oak Ridge National Laboratory (ORNL) - Materials Science & Technology Division	Licensor	Major	
Abakan	Investor	Major	
Mattson Technology	Supplier	Major	

Key competitors

Direct competitors: Integran Technologies, Modumetal, Xtalic, Sub-One Technology, Inframat, Dynamic Materials Corporation, The Japan Steel Works, CladTek

Organization Information
MesoCoat

Euclid, OH
United States
www.MesoCoat.com
Stage of development: Introduction

Technologies and materials: Coatings; Tungsten carbide nanoparticles; Titanium nitride nanoparticles; Silicon nitride nanoparticles; Metal cladding
Products: Nanointermediates; Coatings
Processes: Thermal spray; High energy density fusion cladding
Properties: Low-friction; Wear resistant; Anticorrosion; Non-toxic
Applications: Aerospace applications; Industrial equipment; Oil and gas; Defense applications

Interviewed: Andrew Sherman (CEO), Anupam Ghildyal (Senior Business Associate)
Updated: June 20, 2011

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