TiBor Skin

Roland Seals, PhD

Senior R&D Scientist and Technical Consultant
Engineering Division

Tennessee NEXT Conference

May 6, 2011

Inventor's Interests and Experience

- Before joining Y-12 in 1977 was a graduate student in Department of Chemistry at Virginia Polytechnic Institute
- Has received Gold Acorn Award for Patents Issued, Photonics Circle of Excellence Award and Award of Excellence for Significant Contributions to the Nuclear Weapons Program
- Won 2008 R&D 100 Award for Nano-Wool™
- Currently focused on R&D activities in various areas of materials and manufacturing technology development and manufacturing development solutions
- Holds 12 U.S. patents and has an additional 6 patents pending

TiBor Skin Description

Provides a family of coatings or surface materials on substrate metal alloy systems for wear and corrosion applications.

Method includes depositing a slurry or paste of titanium diboride and a flux along with other trace components on a substrate and heating the deposited material and the substrate to form a reinforced material interjoined with the substrate.

Description, cont.

The slurry, suspension, blend or mixture of selective materials can be deposited onto the surface using a number of methods such as painting, spraying, dipping, thermal spray, powder coating, etc.

Laser, plasma, infrared, electron beam, induction, welding, microwave, etc. techniques can be used to reactively form the surface.

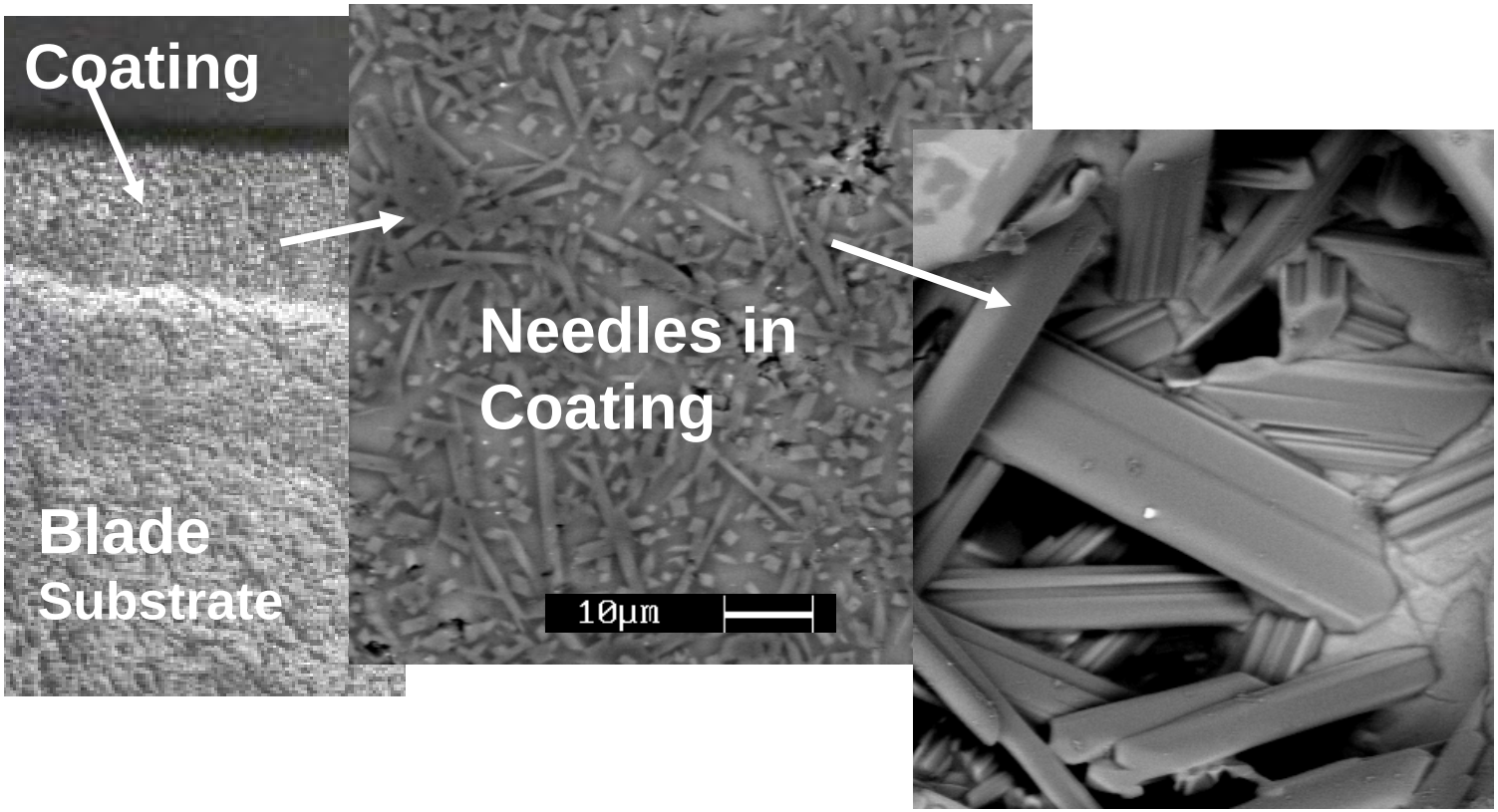
Description, cont.

- Surface coatings formed by the approach change the surface characteristics of a component or structure to provide properties of high hardness, high temperature strength, wear and corrosion resistance and strong adherence to the substrate without changing the bulk material properties.
- Layers or functional grading can be employed to increase bonding strength and adherence or mitigate differences in coefficient of thermal expansion.
- Surface can be applied on finished components by portable, field techniques or fabricated on sheet materials prior to final manufacturing steps.

Description, cont.

Patent-pending

- US 2009/0282949



Description, cont.

Novelty

- Targeted - lends itself to localized surface heating methods in contrast to bulk heating techniques
- Integral - does not distort substrate geometry, reduce surface smoothness or allow for delamination
- Versatile - may be applied to raw materials prior to manufacturing or to parts after manufacturing
- Thorough - replaces need for other coating techniques such as plasma spraying, sputtering and plating
- Broad - can also be employed to aid in bonding of dissimilar materials

Customer Experience

- Without TiBor Skin and with traditional corrosion- and wear-resistant coatings for metals, customers experience high frustration with:
  - weight of coated substrate
  - wear-related phenomena such as frequency of edge repair/sharpening, part replacement
  - problems associated with high temperatures
- TiBor Skin reduces company expenses by prolonging life of machinery components and reducing maintenance costs.

U.S. Market Size

2007 NAICS Code	Industry	No. of Establishments	Sales, Revenue, Business Done ($1,000)
332213	Saw blade and handsaw manufacturing	132	1,491,041
333512	Machine tool (metal cutting types) manufacturing	389	5,621,453
333515	Cutting tool and machine tool accessory manufacturing	1,812	5,389,380
332991	Ball and roller bearing manufacturing	184	7,546,903
336311	Carburetor, piston, piston ring, and valve manufacturing	119	2,172,042

Commercialization Strategy

- Focused on licensing IP
  - Dept of Energy's Start-Up America initiative
    - $1,000 up-front option fee
  - Y-12 Xpress Terms License
- Technology Readiness
  - TRL 4 – Basic technological components are integrated to establish the pieces will work together. Key pieces of the technology are in the laboratory.
  - Additional applied research needed
  - Regulatory approval not needed
  - No known barriers to industry adoption

Questions/Comments