Frost & Sullivan Award for Excellence in Technology

Award Description

Frost & Sullivan's Excellence in Technology Award is bestowed upon a company that has pioneered the development and introduction of an innovative technology into the market; a technology that has either impacted or has the potential to impact several market sectors. This award recognizes a company's successful technology development that is expected to bring significant contributions to the industry in terms of adoption, change, and competitive posture. It also recognizes the company's overall technical excellence and its commitment toward technology innovation.

Research Methodology

To choose the award recipient, Frost & Sullivan's analyst team tracks technology innovation in key hi-tech markets. The selection process includes primary participant interviews and extensive primary and secondary research via the bottom-up approach. The analyst team shortlists candidates on the basis of a set of qualitative and quantitative measurements. The analysts also consider the pace of technology innovation, and the potential relevance or significance of the technology to the overall industry. The ultimate award recipient is chosen after a thorough evaluation of this research.

Measurement Criteria

In addition to the methodology described above, there are specific criteria used to determine the final rankings. The recipient of this award has excelled based on one or more of the following criteria:

- Number of new technologies developed or introduced
- Significance of a technology/ technologies in the industry
- Competitive advantage of technology/technologies vis-à-vis competing technologies
- Ease of adoption of new technology/ technologies
- Potential of technology/ technologies to become an industry standard
- General impact of technology in terms of shifting R&D focus

NanoMech™

Award Recipient: NanoMech LLC

Frost & Sullivan's 2005 Excellence in Technology Award in the field of Advanced Coatings and Surface Technologies, Spray Coatings, goes to NanoMech LLC for its development of nanostructured cBN (Cubic Boron Nitride) coatings for cutting tools. These coatings are based on an Electrostatic Spray Coating (ESC) process. National Science Foundation funded research at the University of Arkansas and NanoMech LLC has demonstrated the feasibility of using such cBN coatings for tool inserts.

Previously cBN coatings were limited in thickness and have suffered from the poor performance of physical vapor deposition, chemical vapor deposition (PVD and CVD) and hybrid techniques. NanoMech's approach for producing cBN coatings has overcome the limitations of the previous techniques. NanoMech's coating process consists of two steps. The first step deals with the application of the cBN micro- or nano-size particles onto carbide cutting tools using the ESC process. The NanoSpray™ ESC process involves physical spray of presynthesized materials, such as nanoparticles in powder or suspension form, under the influence of an electric field. The presence of an electric field facilitates the formation of a coating of desired thickness through field-assisted, directed self-assembly.

The particles get charged as they come out of the powder spray gun and are exposed to the electrostatic field. Later the charged particles follow the electric field lines towards the substrate and arrange themselves in the form of a uniform coating. Significantly, the ESC process has been carried out at room temperature and pressure. The process is capable of producing single and multiphase material with the properties that suit abrasive, lubricating, anti-corrosion, optical, electrical and thermal functions among others.

In the particular example of a cBN particulate coating, once the coating is applied using the ESC process, titanium nitride is introduced as a binder using chemical vapor infiltration (CVI). CVI is a spin-off of CVD, wherein vapor phases of the reactants are infiltrated into the cBN particulate matrix to precipitate titanium nitride. This results in the production of a composite coating, NanoTuff™, that exhibits excellent adhesion and wear properties. Such coatings can also withstand high temperatures associated with high-speed machining of hard materials such as hardened steels.

NanoMech's innovation could potentially enhance the machining productivity for manufacturers who are continually looking for ways to produce more at lower cost. It also opens up the possibility of using cBN coated tools in applications that were not practical previously. NanoMech's cBN-TiN coated tools offer much better performance than tools using conventional coatings.

The company has exclusive rights to its ESC process and the method of making cBN-TiN coatings. NanoMech has exclusive license from the University of Arkansas to US Patent #6,607,782 and #6,544,599 and has other patents pending for related aspects of the technology and its applications. Initial applications are principally in the automotive, aerospace, heavy industrial and other industrial sectors. But such coatings could also be employed in other applications in the form of wear-resistant and corrosion-resistant coatings, biocidal coatings, super-hydrophobic coatings, and biomedical passive and active coatings for use in biomedical devices. These applications are made possible because this unique technology allows deposition of a wide selection of materials in various permutations and combinations specifically derived for the intended applications and market sectors.

In addition, NanoMech has developed novel solid lubricants based on organic and inorganic composite nanoparticles, which are being marketed under the trade name NanoGlide™ that can be applied on top of their hard coatings to further improve performance in a variety of applications. The company's patent pending NanoGlide™ solid lubricants also can be used as additives to produce advanced oils and greases with superior stability, improved friction and wear performance, and reduced energy dissipation.

In summary, Frost & Sullivan's Award for Excellence in Technology recognizes NanoMech's development of new cBN coatings for hard cutting tools via an innovative Electrostatic Spray Coating process for advanced machining and manufacturing. This innovative method for producing nanostructured coatings could have wide ramifications across several industrial sectors.