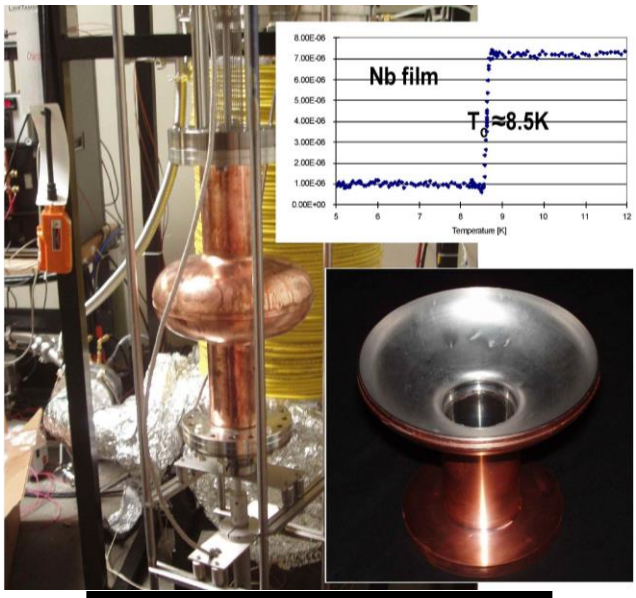
Alameda Applied Sciences Corporation

Coaxial Energetic Deposition of Superconducting Films for SRF Cavities



PRODUCT INFORMATION

Technical Description:

Alameda Applied Sciences Corp has developed a proprietary Coaxial Energetic Deposition (CED™) process to deposit Nb, MgB_2 and other superconducting thin films inside RF cavities for advanced accelerators. CED™ uses ***energetic ion deposition*** & ***plasma immersion ion implantation*** in coaxial, planar and complex substrates for advanced surface modification. ***Energetic ions*** (20 eV to 200 eV) interact with the first few monolayers of the substrate to break up voids and columnar microstructures.

Capability / Advantage over Other Technologies:

- Produces dense films
- Deposits metals and alloys (Nb, MgB_2, Nb_3Sn, Mo_3Re)
- Creates films with low pinhole defect density
- Creates strong adhesion via stress relief and substrate/film inter-mixing

Relevance to Customer / End User:

There are over 17,000 radio frequency (RF) accelerators in the world today, most of which are used in medicine and industry. If superconducting RF (SRF) technology were to replace normal conducting RF technology, an energy savings of 1000× could be realized. However, existing, <10 K temperature SRF technology has not yet matched the reliable operation and maturity of normal RF technology. Further cost savings can be achieved if higher temperature superconductors were to be implemented. For example, an 8K increase in operating temperature would cut operating costs in half and would make SRF technology more attractive for commercial applications.

Relevance to Other Applications:

AASC has also explored CED™ deposition of thin films on the inside of the high value tubes required in ethylene cracking furnaces. Ethylene and other olefins are cracked in large furnaces. Cracking ethylene leads to carbon based soot commonly called coke that can clog the furnace tubes. The furnaces must shutdown periodically to clean the tubes. The cost of yearly maintenance of furnaces for coke build exceeds $1B/year worldwide. AASC has already demonstrated that CED™ ceramic coatings can increase the time between shutdowns, thus improving the capacity factor of the furnaces.

COMPANY INFORMATION

Company: Incorporated in 1994, AASC focuses on pulsed plasma devices. Customers include large multinational companies and research organizations.

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APPLICATION/INSERTION INFORMATION

Transition/Insertion Issues:

The company that can produce a viable SRF cavity based upon high temperature superconductors can become the dominant SRF cavity supplier for large research programs and industry alike, with the proper relationships and IP protection in place. AASC has an on-going relationship with Thomas Jefferson National Accelerator Facility, one of the largest suppliers and qualifiers of SRF cavities for large accelerators in the U.S. We also work with Fermi Lab on these initiatives via CRADAs. If our SRF cavities were implemented on major planned accelerators, the sales opportunity could be greater than $250M over 5 years. Industry sales could be much higher.

IP:

AASC has a patent pending on our coating method process for MgB_2 and Nb. We anticipate additional disclosures.

Status of Technology:

AASC has built infrastructure using >$3M of DOE funding since 2004. Each successful cavity coating pushes the boundary of SRF performance. With a suitable manufacturing partner, we will coat cavities with various thin films, test them at accelerator facilities, and deliver new technology to SRF accelerator systems worldwide.