

# T<sub>C</sub>SUH Special Seminar

Texas Center for Superconductivity at the University of Houston



## Prof. Dr. Herbert C. Freyhardt

Institut fuer Materialphysik, Universitaet Goettingen and  
Zentrum fuer Funktionswerkstoffe, gem. GmbH, Germany

### “Processing of High-Performance Coated Conductors: A Challenge for Basic R&D”

**Friday, April 21, 2006**

Room 102, Houston Science Center

12:00 noon – 1:00 p.m.

#### Abstract

YBaCuO or REBaCuO coated conductors (CC) based on polycrystalline Ni-Cr alloys / stainless steel (SS) and thermomechanically treated (RABiTS) substrates are processed to exhibit high critical and engineering current densities. Both vacuum and non-vacuum technologies are employed to coat the substrate tapes with single/multilayer buffers, HTS films and conductive/protective overlayers. It was our goal to develop vacuum-technological methods with particular efforts on ion-beam assisted deposition (IBAD) of YSZ and pulsed laser deposition (PLD) of the HTS, where conductor architectures SS / IBAD-YSZ / CeO<sub>2</sub> / PLD-YBCO yielded conductors with attractive critical current densities in the HTS over 3 MA/cm<sup>2</sup> as well as  $I_c \cdot L$  values up to 9400 (A/cm-w) · m in reproducibly processed and robust 40m-long CC.

Whereas the technological challenge is to reliably fabricate long lengths of robust CC, with specifications determined by the respective application, the supporting knowledge base and an advanced basic understanding will enable us to control (i) the growth of multilayers with their interfaces, (ii) the mechanical and electromechanical properties of CC, (iii) current flow in the HTS film and through grain boundaries, as well as (iv) flux pinning in the HTS layer.

The contribution intends to highlight progress in fundamental R&D as a basis to reliably manufacture second-generation wires.

#### Brief Bio

Herbert C. Freyhardt, born in 1941 and educated in Germany, studied physics (1961-1970) at the University of Goettingen (Diploma & PhD Thesis, which were finished in 1963 and 1970, respectively; later on Habilitation). As a Visiting Scientist he worked in 1972/73 at Argonne National Laboratory. After 1973, extended stays brought him to European countries or abroad to the USA, Japan, Korea and China, also to conduct research.

Prof. Freyhardt is presently a member of the board of the Institut fuer Materialphysik of the University of Goettingen and Managing Director of the Zentrum fuer Funktionswerkstoffe gem. GmbH (Center for Applied Materials Research) Goettingen. He is a Universitätsprofessor, teaching materials science and solid state physics. As a physicist he has devoted his research to materials and solid state science, in particular superconductivity and superconducting materials, metastable and amorphous alloys, composite materials, thin film oxides, magnetic materials, bulk and thin-film high-temperature superconductor's as well as growth and characterization of metal and semiconducting single crystals, with a long list of scientific publications. He established in 1990, together with a colleague from the University of Clausthal, the Zentrum fuer Funktionswerkstoffe (ZFW) as a company of public benefit. The ZFW is developing functional materials for technical applications.

Prof. Freyhardt has participated in many national and international projects and has developed a close cooperation with industry. He has also served on numerous reviewing panels of national and international R&D programs. He has organized many workshops and conferences and initiated in 1993 the European Conferences on Applied Superconductivity (EUCAS).

*Persons with disabilities who require special accommodations in attending this lecture should call (713) 743-8210 as soon as possible.*



TEXAS CENTER FOR  
SUPERCONDUCTIVITY