Seminarvortrag **Fachgebiet Mikrotechnik**

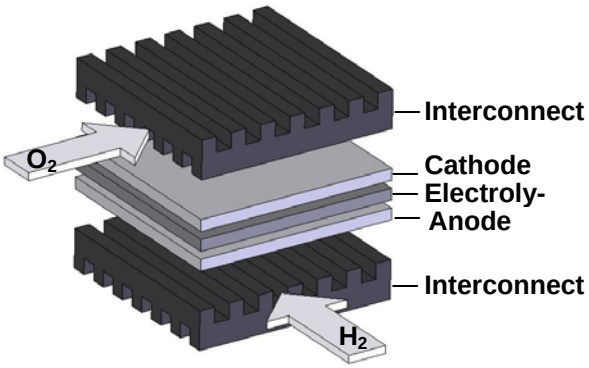
Dienstag, den 7. November 2006 **16:15 – 18:00 Uhr**

Ort: Neues Physikgebäude 1. Etage Westflügel Raum PN 115 A

Active brazing technologies for planar solid oxide fuel cell seals

Dipl.-Ing. Johannes-Moritz Buscher

There are currently big efforts to replace the fossil fuel based energy generation with sustainable energy sources. A renewable energy system e. g. by use of hydrogen as an energy carrier would be an optimal solution. Fuel cells powered by hydrogen yield substantial reductions or even total prevention of emissions of unhealthy and climate change gases and promise an end of carbon fuels as a dirty energy source.



There are many different methods to convert chemical energy to electricity with fuel cells via an electrochemical reaction. Solid oxide fuel cells (SOFC's) have become increasingly attractive for a number of reasons, including their high efficiency (up to 65%) and low emissions. Among different types of SOFC's, the planar type is expected to be a robust, high power-density and cost-effective design.

However, seals in the planar design are a big issue. Seals in SOFC stacks do not only prevent mixing of fuel and air, but also keep the fuel from leaking out of the stack. Further, the seal material needs to exhibit special properties due to the particular operating conditions of a SOFC.

In this presentation the focus is on the development of a solder compound as a seal material for a planar SOFC-design. A new copper based braze has been developed for sealing electrolyte and/or anode supported planar solid oxide fuel cells-interconnect repeats. This active braze compound incorporates reactive components to facilitate chemical bonding with YSZ-ceramics. Further, this precious-metal free braze is designed with a solidus temperature above 950 °C to extend operational range, minimize chemical reactivity, and form a permanent gas tight seal.

Oxidation resistance is attained by means of a diffusion limited aluminum oxide scale, which also serves to negate electrical conductivity. Small YSZ-YSZ, YSZ-Crofer 22 APU, and Ni/YSZ-Crofer 22 APU coupons were brazed with several variations in composition under either vacuum or inert atmosphere and characterized via SEM / EDX analysis and conductivity measurements.