European Research Training Network "Surface Engineering of New Alloys for Super High Efficiency Power Generation"

Present developments for advanced fossil power stations aim at increased thermal efficiencies and the reduction of CO_2 emissions. In particular with regard to the latter ambitious goals have been established with e.g. reduction of CO_2 emission by 40% within the next 10 years (Germany). These goals can, however, not be accomplished without significant development in the field of new materials for application in these power stations. For reasons of the strategic importance of this topic it is necessary to educate the next generation of researchers in this field. This can be done best by combining the development of new materials and of surface technologies in a joint effort of some of the key laboratories in high temperature materials research of Europe with the training of young researchers on this topic in the same labs. Therefore, a research programme was established for materials of the next generation of fossil power plants aiming at materials of increased high temperature corrosion, erosion-corrosion and creep-corrosion resistance properties in the environments produced in such plants. This innovative research and training programme will be undertaken by the following 8 partners from 6 European countries:

- Prof. Howard Stott, coordinator (UMIST, United Kingdom)
- Dr. W. J. Quadakkers (FZ Jülich, Germany)
- Dr. Michael Spiegel (Max-Planck-Institut für Eisenforschung, Germany)
- Dr. David Baxter (Joint Research Centre Petten, Netherlands)
- Dr. Michael Pomeroy (University of Limerick, Ireland)
- Prof. Dimitrios Tsipas (Aristoteles University Thessaloniki, Greece)
- Prof. Michael Schütze (KWI-DECHEMA, Germany)
- Prof. Francesco Pérez Trujillo (Universidad Complutense de Madrid, Spain)

The scientific and technological steps in the programme are

- development of detailed laboratory methodologies for evaluation of materials for advanced ultra-high efficiency power plants
- improved basic scientific and mechanistic understanding of the behaviour of new metallic heat-exchanger alloys in power plants operating under advanced steam conditions, at temperatures significantly higher than those used currently, and in environments produced by combustion of coal, biomass and waste including
  - mechanisms and rates of steamside and fireside corrosion and corrosion-erosion
  - the effects of corrosion on creep of ferritic and austenitic alloys
  - the corrosion characteristics of welds and the heat-effected zones, especially dissimilar welds and weld overlays
- formulation of more reliable models for structural materials behaviour on the atomic scale leading to improved lifetime assessment
- development of novel coatings and surface engineering treatments for increased fireside corrosion resistance on an improved scientific basis
- incorporation of performance data in design concepts, modelling, fabrication, maintenance and lifetime prediction

This development work is done in close cooperation with several industrial companies involved in the project who also committed themselves to contribute to the training of the young researchers from a practical point of view including work stays of the young researchers to be trained at these

companies. Furthermore, special training activities of the research labs will help the young researchers to develop an all-round appreciation of power generation and incineration systems together with a detailed knowledge of corrosion test methods, corrosion mechanisms and corrosion protection/prevention. The programme has started in spring 2002 and will have a duration of 4 years. The young researchers must be from a different country than the one of the lab where they will be working in and in some labs positions are still available for this training programme.

Further information on this programme can be obtained from the coordinator:

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