

### **Helium Cooled Pebble Bed (HCPB) Blankets:**

#### **Recent achievements in advanced neutron multiplier and breeder materials production**

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In future fusion reactors, Lithium will be needed for the generation of the fuel, tritium. Therefore a so called Helium Cooled Pebble Bed Blanket (HCPB) is being developed in Europe and other ITER parties. Lithium in the form of ceramic pebbles is foreseen as breeder while Beryllium or Beryllides serve as neutron multiplier. Within the campus of the Karlsruhe Institute of Technology (KIT) that has a key role in the materials R&D for nuclear fusion, Pilot Production facilities have been build up by the company GVT to produce amounts of several kilograms.

Lithium orthosilicate pebbles are the present reference material, they are fabricated by melt-spraying with 2.5 wt% excess of silica, resulting in a two-phase material of lithium orthosilicate and metasilicate. A modified melt-based process was used to fabricate breeder pebbles with additions of titania in order to obtain pebbles with lithium metatitanate as a secondary phase. These pebbles may have the potential to combine the advantages of both, lithium orthosilicate and metatitanate breeder ceramics.

GVT also runs a Beryllium Handling Facility (KBHF), The necessary Beryllium safety was build up with the support of KIT and the Company HIMA (Brühl, Germany). In Cooperation with the Institute for Applied Materials (KIT), the world market leader for Beryllium Products, MATERION (Ohio, USA) and the Research Center for Hot Extrusion of the TU-Berlin, new production methods for Beryllium based materials are presently being qualified. While for an ITER Solid Breeder Test Blanket about 150 Kg of breeder and 300 Kg of multiplier will be necessary that might be produced by an upscaling of laboratory techniques, DEMO reactor would need about 1000 times higher quantities and therefore industrial fabrication processes.

This paper shall give an overview concerning the recent achievements and give a future glance in the direction of advanced neutron multiplier and breeder materials production including the necessary safety conditions.

*Abstract must fit in the above box*

**Topic: Energy Development Facilities, Fuel handling and processing**

**Preference: oral or poster presentation**