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Activities for fusion energy functional and plasma facing material research at the University of Latvia

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In the frame of EUROfusion consortium programme, Institute of Chemical Physics and Faculty of Chemistry of the University of Latvia are performing investigations on plasma facing, neutron multiplying and self-sufficient tritium generating functional materials for the use of International Thermonuclear Experimental Reactor (ITER) and DEMOnstration power plant.
Be is used as plasma facing material in form of tiles and is considered to be used as neutron multiplier in form of pebbles in the He cooled pebble bed (HCPB) test blanket module (TBM) of ITER and DEMO. Tritium distribution was determined with dissolution method, release characteristics –with thermal desorption spectroscopy (TDS). Tritium release from neutron irradiated pebbles shows importance of material microstructure, irradiation temperature on the accumulated tritium amount and release characteristics and indicates to positioning of tile as determining factor for tritium accumulation and distribution.
Lithium based ceramics –lithium orthosilicate and metatitanate, are considered breeder materials in HCPB TBM. As formation of radiation-induced defects (RD) and radiolysis products (RP) may occur in tritium breeding ceramics during operating conditions, it can affect the tritium generated and may disturb its diffusion and release. Changes of RD and RP formation depending on absorbed dose were analysed by electron spin resonance spectroscopy, thermally stimulated luminescence technique etc.
Carbon fibre composite (CFC) materials have been used as divertor and plasma facing materials in fusion devices, including Joint European Torus (JET) until 2009. W-coated CFC tiles are used in the JET ITER-like wall divertor. During active operation, plasma-wall interactions (erosion, formation of dust, fullerenes and long-chain hydrocarbons, tritium retention) occur. Tritium distribution in the JET tiles and dusts was determined with full combustion and liquid scintillation method, desorption process is analysed by TDS to investigate tritium retention mechanisms.
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