Contribution ID: **265** Type: **not specified**

Testing of ceramic membranes for PEG separation and preliminary design of a membrane cascade

Monday, 17 September 2018 11:00 (2 hours)

The Plasma Exhausts Gases (PEGs) proposed to reduce the power load over the plasma facing components are separated by the Plasma Exhaust Processing System of DEMO.
Two kinds of ceramic porous membranes (with top layer of pore size 0.2 μm and 3-4 nm, respectively) used commercially for the filtration of liquids have been tested in order to verify their application for the PEG separation. The experiments have been carried out at room temperature with feed pressure in the range 100-180 kPa and permeate pressure of 100 kPa by testing Ar, N2, He and H2. The results of the experiments have been exploited to validate a gas mass transfer model taking into account the permeation mechanisms of Knudsen and Poiseuille and, then, the model has been used to assess the permeance of the molecule DT.
According to the processing requirements for the PEG separation of DEMO and based on the permeance and selectivity values of the commercial membranes calculated by the model, a membrane system consisting of ceramic membranes (top layer of pore size 0.2 μm) followed by a Pd-Ag permeator has been assessed. The calculation of a counter-current recycle cascade of ceramic membranes porous membranes has been conducted via the simplified Underwood-Fenske method under the hypothesis to use Ar as PEG. By vacuum pumping the permeate of the ceramic membrane cascade at 10 mbar the maximum Ar concentration in the retentate is 99.95%, while the higher Ar concentration of 99.995% can be achieved with a vacuum level in the permeate of 1 mbar. In both the cases, the Pd-permeator downstream the ceramic membrane cascade recovers about the 99% of the DT fed in form of ultrapure gas.

Co-author: TOSTI, Silvano (CIRDER University of Tuscia)

Presenter: TOSTI, Silvano (CIRDER University of Tuscia)

Session Classification: P1