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[Invited Oral] Separator of ^3He isotope from liquid ^4He

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Nowadays the worldwide market of ^3He isotope is under strong crisis. The new technologies of radiological and nuclear materials detectors as well as science, industrial and medicine applications required a large amount of this helium isotope. On the other hand, a production of the nuclear weapon, which ^3He is a by-product, is successively reduced last decades. Therefore to meet the ^3He market demands an exploration of new sources of this isotope need to be considered.

One of alternative ^3He isotope source is liquid ^4He . Unfortunately, its natural concentration in ^4He varies from a few tenths to a few ppm only. Moreover, last years a drastic increase of liquid ^4He price is observed, what can cause the ^3He separation cost extremely high. The places where the ^3He separator installation can still provide financial profit are large liquid helium production plants. PGNiG SA branch Odolanow in Poland, with of about 100 kg/h LHe production, makes an attractive place for such installation. Therefore, Wrocław University of Technology, PGNiG SA and Institute of Molecular Physics of Polish Academy of Sciences in Poznan, Poland, launch a pilot program to design and run a prototype separator of ^3He from ^4He .

Paper presents description and conceptual design of the ^3He from ^4He separation cryostat. The separator consists the J-T scheme based cooling loop with external warm compressor for helium vapor pressure lowering, the recuperative heat exchanger working between 4.2K and 1.5K as well as the separation vessel with so call "entropy filter". The advantage of the separator is that the LHe stream leaving device after separation will still under the liquid form, which remains its marked value, what keeps the cost of ^3He separation on the low level.

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