CARBON NANOSTRUCTURE REINFORCED POLYMER ELECTROLYTE MEMBRANES FOR ELECTROCHEMICAL TRITIUM SEPARATION

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Tritium (^{3}H or T) is a radioactive isotope of hydrogen with potential use as a fuel for nuclear fusion reactors for deuterium-tritium fusion to produce energy. Currently most of tritium is produced in CANDU type fission reactors as a by-product of neutron capture in heavy water coolant and moderator.[1] To produce fuel grade tritium, it is important to separate it from other hydrogen isotopes. One of the hydrogen isotope separation methods is electrochemical separation using polymer electrolyte membrane (PEM) water electrolysis.

Tritium enrichment by graphene coated proton exchange membrane has been previously reported.[2] In this study various proton exchange membranes reinforced with carbon nanostructures (graphene and carbon nanotubes) are developed and used to study improvement of tritium separation by electrolysis. Scheme of electrolyser for tritiated water electrolysis is in Fig. 1.

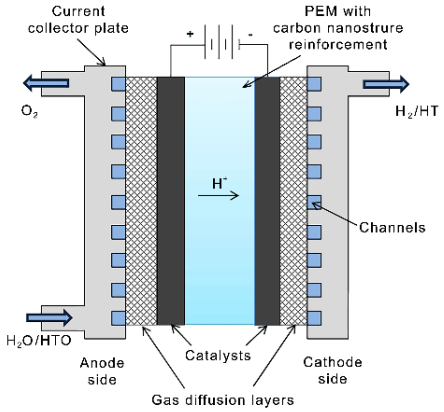

Fig. 1. Schematics of PEM electrolyser

To determine tritium separation factor, measurements of radioactivity of electrolysed tritiated water are done by liquid scintillation counting and generated tritiated hydrogen gas activity measurements are done by proportional counter.

References

1. R. Pearson, A. Antoniazzi, W. Nutall, *Fusion Engineering and Design*, 2018, Vol. 136, 1140-1148.
2. R. J. Zabolockis, M. Sondars, E. Pajuste at al., *Nuclear Fusion*, 2024, Vol. 64, 2.