

**ACTIVATION OF FLIBE BY 14 MEV DT NEUTRONS**A. Klix<sup>1</sup>, T. Tanaka<sup>2</sup>, T. Nishitani<sup>3</sup><sup>1</sup>Nuclear Engineering Research Laboratory, University of Tokyo, Tokaimura, Japan<sup>2</sup>National Institute for Fusion Science, Toki, Japan<sup>3</sup>FNS, Japan Atomic Energy Research Institute, Tokaimura, Japan  
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Flibe (2LiF+BeF<sub>2</sub>) is a candidate material for liquid breeders and liquid First Walls. During reactor operation, radioactivity will be induced by fast and slow neutrons arising from Flibe as well as impurities. Especially some isotopes with a longer half life time will be distributed in the entire molten salt loop by the flowing Flibe. Therefore, an experimental investigation of material activation is important to assess issues of safety, maintenance, nuclear heating, and decommission/waste management.

In preparation of irradiation experiments of Flibe with MeV DT neutrons at FNS/JAERI, we have performed activation calculations with the code system EASY-2005. A neutron spectrum with 14 MeV peak and a flux of  $4 \times 10^{13}$  n/cm<sup>2</sup>/sec with an irradiation time of 1 year had been chosen. The main contributions to the contact dose rate came from <sup>16</sup>N and <sup>19</sup>O for cooling times <1 min and <sup>18</sup>F for times 1 min - 20 hr. For cooling times >20 hr, the isotopes <sup>22</sup>Na and <sup>7</sup>Be dominate. They are produced in an appreciable quantity by sequential charged particle reactions. Calculations have been performed also for Flibe containing estimated amounts of impurities (Na 400 ppm, S 200 ppm, K 1200 ppm, Ca 200 ppm from local analysis; Al 20 ppm, Cr 30 ppm, Fe 10 ppm, Ni 10 ppm from Ref.1), however, they yielded negligible contributions to the total dose rate compared to that of <sup>18</sup>F, and <sup>22</sup>Na. Approximately half of the <sup>22</sup>Na was produced by sequential charged particle reactions from <sup>19</sup>F in this scenario. Major radioactive isotopes from impurities were <sup>13</sup>N, <sup>24</sup>Na, <sup>38</sup>K, <sup>41</sup>Ar, and <sup>38</sup>Cl. It is expected that a purification process used to remove traces of water in Flibe will also reduce the amount of metal impurities.

Aim of the scheduled irradiation experiments is to investigate induced radioactivity of Flibe before and after purification and compare the results with calculations. The samples are pellets of solid Flibe with a diameter of 1.2 cm and a thickness of approximately 2 mm. They will be irradiated with the DT neutron sources of FNS which can deliver up to  $4 \times 10^{12}$  neutrons/s at 14 MeV. First results will be presented at the conference.

## References

- 1) N. Iwamoto et.al., J.Chem.Soc. Faraday Trans. 75 (1975) p.1277