## § 3. Design of the Blanket of FFHR

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### 1. Objective of the study

Fusion reactor, which has a good public acceptance, should be economic and highly safe. Helical type reactor has a good characteristic as a steady state reactor. Moreover when flibe (LiF-$BeF_2$) is used as a breeding material and as a coolant, the reactor has a good feature in blanket temperature and safety[1]. Considering these good features of flibe, blanket of FFHR has been designed reflecting recent research results. For the design of blanket, restricting conditions should be considered from materials, neutronics design, heat transfer and hydraulics, structural design, magnet and tritium recovery. By doing these considerations, the widening of the design window can be effectively evaluated. The design studies also can show the necessary R&D subjects and in return the achievements of the R&D activities could be reflected on the design studies [2].

### 2. Results and discussion

Required features as an advanced blanket were studied from following points:

- To be manufactured
- To be operated for short and long-term under the blanket conditions
- To show the required performance (tritium generation and recovery, heat removal, shielding)
- To be safe and environmentally acceptable (for normal and abnormal operation, wastes)
- To be acceptable from economic viewpoints

For flibe blanket, followings are the key points. For these key issues the results of Japan — US collaboration, JUPITER-II, have been effectively reflected.

- Redox control by Be is vitally important to reduce corrosion of the structural material. If the partial pressure of TH(HF) can be controlled low enough, this problem will be solved. In JUPITER-II, redox experiment is planned to ascertain this effectiveness [3,4].
- Enhancement of heat transfer is also important. It was shown that the improvement of structural materials and heat transfer enhancement by using surface enlarged cooling tube could solve this issue [5].
- Effective tritium recovery can be conducted with low tritium permeation leakage[6].
- Pressure drop across the heat exchanger and tritium leakage at pumps were found to be important.
- For maintenance of the reactor, the possibility of exchangeable magnet, which uses high temperature super conducting coils, has been studied [7]. It will show a good breakthrough in the blanket design.

References

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