



DUPIC Fuel Development Program in Korea

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A fuel cycle concept for PWR-CANDU synergism was developed for the reutilization of spent PWR fuel in CANDU reactor without adopting the conventional wet reprocessing. The concept was named as DUPIC (Direct use of spent PWR fuel in CANDU reactor), and the rationale is to directly refabricate the radioactive spent PWR fuel into CANDU fuel in remote manner at the shielded facility.

Based on the conclusion of the feasibility study completed in 1993, the powder processing method called as OREOX (Oxidation and reduction of oxide fuel) process was selected as a most promising process among various options for the fabrication of DUPIC fuel mainly due to its homogeneity of the material properties of the fabricated products. The OREOX process is schematically shown in Fig. 1. In OREOX process, the fuel pellets of the spent PWR fuel are taken out by the mechanical and oxidative decladding process. Then, the fuel pellets are subject to the repeated oxidation and reduction to improve the powder properties for the fabrication of the high density DUPIC pellets. Once the resinterable powder has been prepared, the following fabrication process is almost identical to that of the conventional CANDU fuel fabrication except that all the DUPIC fuel fabrication will be performed in remote way.

In order to experimentally verify the performance of DUPIC fuel, KAERI has launched the next phase study in 1993 in cooperation of AECL in Canada and USA. The main objectives of the study currently under way are to fabricate several prototypical DUPIC fuel rods and bundles, and to perform irradiation at material test reactor and post-irradiation examination for the evaluation of the fuel performance. The material flows and plan for the use of the related facility in KAERI for the DUPIC study is shown in Fig. 2. It is the basic principle to fully utilize the already existing facilities for DUPIC study, such as HANARO multi-purpose reactor for the DUPIC fuel irradiation, PIEF (Post irradiation examination facility) and IMEF (Irradiated materials examination facility) for the prototypical DUPIC fuel fabrication, CANDU fuel fabrication facility for the preparation of DUPIC fuel sheathes, etc. However, some improvement of facilities and development of additional equipment are requested. The fuel fabrication equipment which can be operated and maintained in remote manner is currently under design, fabrication and test operation. The fuel test loop facility and small modification of hot cells are also under design and construction. Besides the optimum process conditions are also under study by use of

natural uranium oxide powder and simulated high burnup fuel. It plans that all the necessary preparations will be completed for the actual DUPIC fuel fabrication campaign in 1999. A series of the DUPIC fuel irradiation and the performance evaluation will be performed until the first of next century, on which the future plan of the pilot scale fabrication and performance verification will be prepared.

REFERENCES

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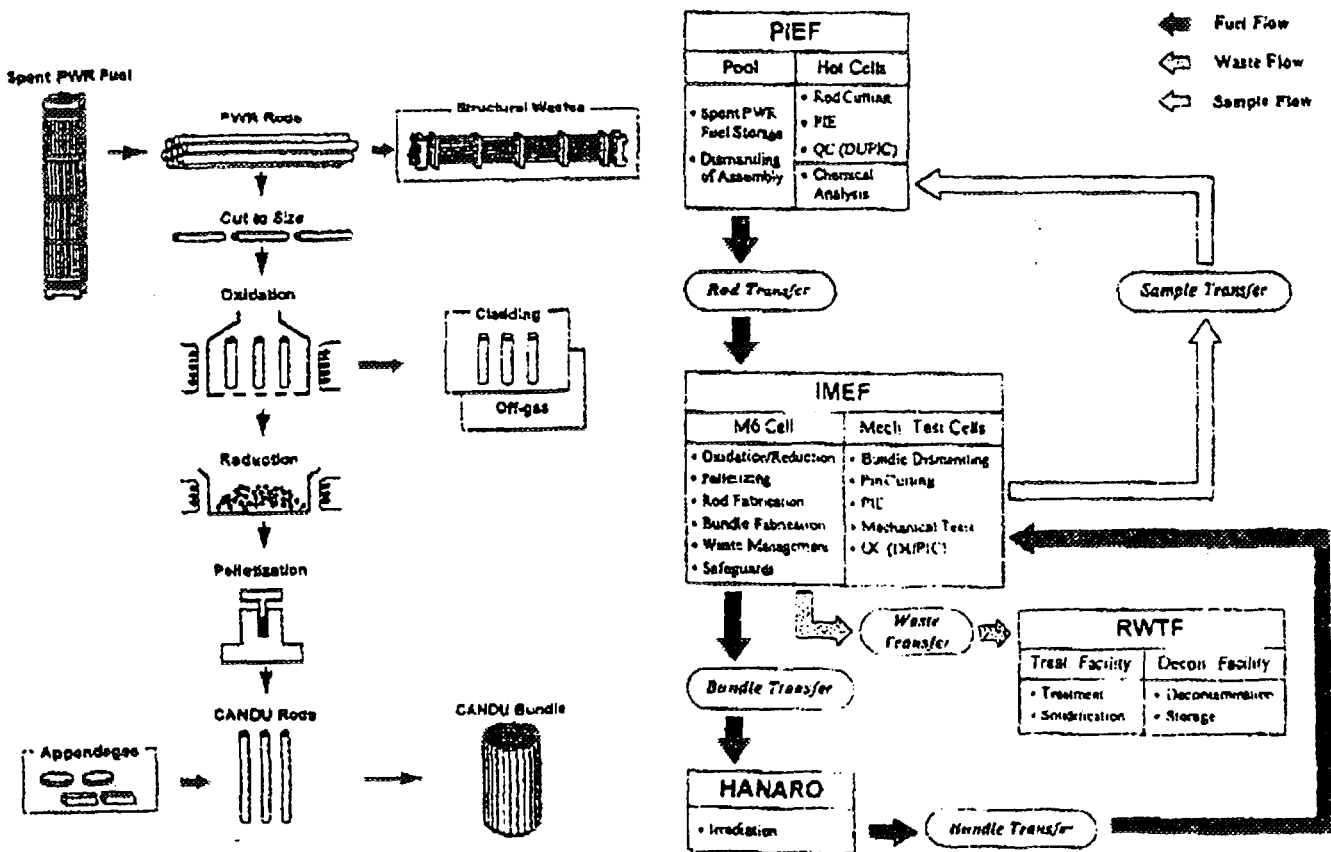


Fig. 1. OREOX process

Fig. 2. Material flow for DUPIC fuel development in KAERI