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Research on pyrohydrolysis of fluoride salts

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TMSR (Thorium-based Molten Salt Reactor) is one of the “Strategic Priority Research Program” of Chinese Academy of Sciences[1]. It offers attractions as power producers because of fuel utilization and safety characteristics. The molten mixture of ThF₄, UF₄ and LiF-BeF₂ was used as fluid fuel in this reactor.

Now we are developing a totally new flow sheet for TMSR fuel cycle in which the pyrohydrolytic technology is included. This kind of technology was first introduced by Warf et al. in the 1950s[2], which convert insoluble halide salts into corresponding oxides under a high temperature. A new designed pyrohydrolysis equipment was used in this work. It consists of a muffle furnace, reaction tube, steam generator and gas collecting system.

Experiments on the different fluoride salts, such as ThF₄, UF₄ and SrF₃ et al, were carried out with this device. The structure of pyrohydrolysis products were studied by Fourier Transform Infrared (FT-IR) and x-ray diffraction (XRD).

[1] Mianheng, J., Hongjie, X., Zhimin, D. (2012) Advanced Fission Energy Program-TMSR Nuclear Energy System. Bulletin of Chinese Academy of Sciences. 27(3): 366-374.

[2] Warf, J.C., Cline, W.D., Tevebaugh, R.D. (1954) Pyrohydrolysis in determination of fluoride and other halides. Anal. Chem. 26(2): 342-346.

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