

# LiCl

## Ion Exchange Properties of Zeolite in LiCl Molten Salt

150

LiCl

RE

Cs Sr

Cs Sr

LiCl Cs Sr

LiCl

### Abstract

An advanced spent fuel management process that is based on Li reduction of the oxide spent fuel to metallic form generates LiCl waste salt containing the alkali, alkaline-earth and some of the rare-earth fission products. The recycling of the LiCl waste salt to the process stream needs periodic removal of the Cs and Sr, which are generating high radioactive decay heat. In this study, zeolite was selected as an absorbent for removal of Cs and Sr in LiCl molten salt phase, and the ion-exchange characteristics were investigated.

1.

LiCl Li

RE

1/4 LiCl Cs Sr [1,2].

1/2 가

LiCl

RE  
 LiCl 가 가  
 LiCl 가 Cs Sr  
 Cs Sr

LiCl Cs Sr  
 가 LiCl  
 [3,4,5].  
 LiCl Cs Sr

LiCl Cs Sr  
 , LiCl Cs Sr Na

2.

가.  
 LiCl Cs Sr  
 1  
 가 가 ( : 3 kw), K type  
 CsCl SrCl<sub>2</sub>, LiCl 가  
 (Ø 9 cm x 15 cm) sus-316 (Ø 9.2 cm x 20 cm) 가

cooling jacket 1  
 port가  
 LiCl  
 magnetic drive  
 LiCl , CsCl SrCl<sub>2</sub>  
 가 chamber chamber  
 가 가 purge  
 20 10 ppm

LiCl 가 LiCl 150 g  
 CsCl, SrCl<sub>2</sub>  
 LiCl 15 LiCl  
 625 675 . Cs Sr  
 1.5 2.0 g

, 25 ml volumetric flask  
 A.A (atomic adsorption spectrophotometer) ICP (induced couple plasma spectrophotometer)

3.  
 가.

50ml 2 g  
 Na, Li  
 30, 120, 240 360 2  
 Na Li  
 LiCl 가  
 가 [6].

LiCl CsCl SrCl<sub>2</sub>  
 3 4 625  
 LiCl Cs Sr LiCl  
 Cs 2 3 Sr  
 3 4 LiCl Cs Sr  
 LiCl Cs  
 Sr  
 LiCl Na Na 1  
 , Cs Sr  
 Na Li  
 , 2 Cs Sr  
 X-ray  
 , lithium aluminum silicate  
 [7].

LiCl Na 가 LiCl  
 LiCl

[8].

LiCl Cs Sr

(1)

가 5 625 , LiCl  
 8 6  
 6 500  
 50  
 100  
 Li LiCl Li

19 wt%  
 12.5 13.9 wt% , 10 11.5

[3].

LiCl LiCl  
 LiCl 가 LiCl

(2)

7 8  
 LiCl Cs Sr  
 가  
 Li Cs  
 4.58 Na Cs 5.28  
 Cs Sr  
 LiCl Cs Sr  
 LiCl 가 가  
 가  
 Li  
 Na LiCl Na 5 LiCl  
 Na 2.75 m-equiv.

LiCl Na  
 Na LiCl Na  
 (3) 2  
 Cs Sr  
 Cs Sr 가 2  
 Cs Sr 9 625 Cs Sr 2  
 Cs Sr  
 Cs Sr 10 LiCl 0.02 m-equiv.  
 가 LiCl Cs , Sr  
 9 가 Cs Sr  
 2 가 가  
 610 lithium  
 aluminum silicate  
 lithium aluminum silicate  
 LiCl Cs Sr 가 , 625  
 가 가 , LiCl  
 가 LiCl  
 4.  
 LiCl Cs Sr ,  
 가 LiCl  
 Cs Sr ,  
 LiCl Cs Sr , 2 4  
 LiCl Li  
 , 2  
 10 11.5 ,

○ , 가 가 .  
○ LiCl 가 ,  
가 .

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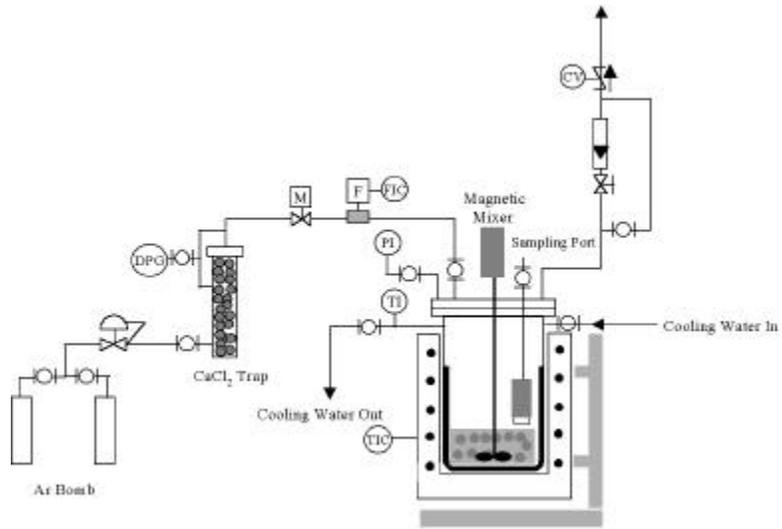


Fig. 1. Schematic of Experimental Apparatus for Batch Ion Exchange Test of Zeolite in LiCl Molten Salt

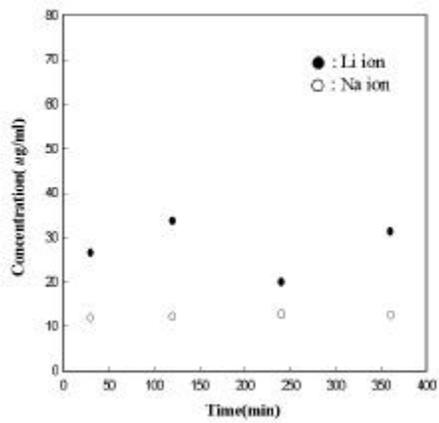


Fig. 2. Leachability of Cations in Salt Occluded Zeolite

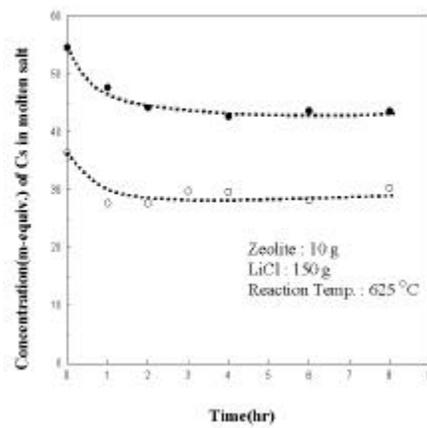


Fig. 3. Ion Exchange Kinetics of Cs Element for Zeolite in LiCl Molten Salt at 625

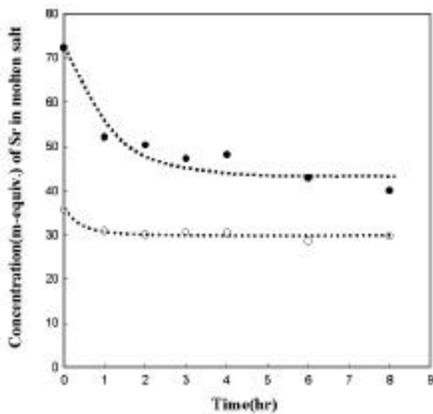


Fig. 4. Ion Exchange Kinetics of Sr Element for Zeolite in LiCl Molten Salt at 625

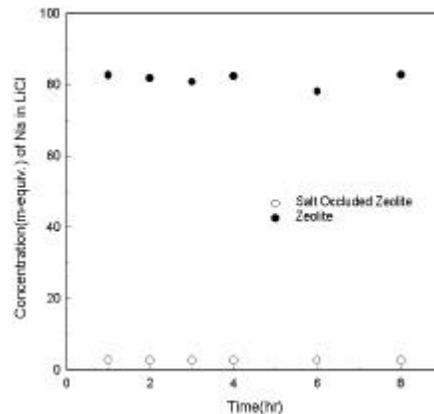


Fig. 5. Sodium Concentration versus Contact Time between Zeolite and LiCl Molten Salt at 625

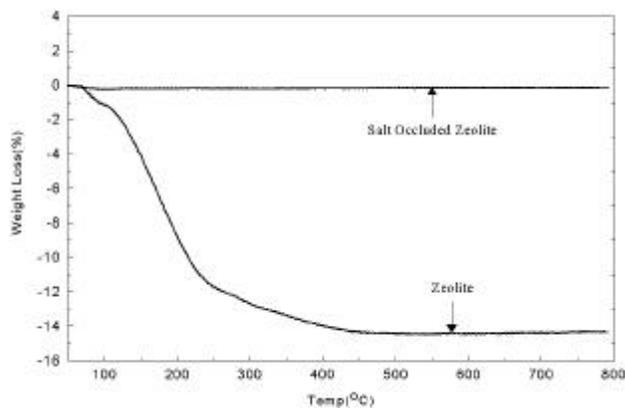


Fig. 6. Comparison of TG Curve of Salt Occluded Zeolite and Zeolite

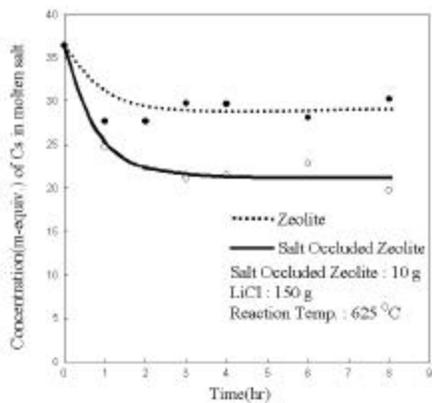


Fig. 7. Ion Exchange Kinetics of Cs Element for Salt Occluded Zeolite in LiCl Molten Salt at 625

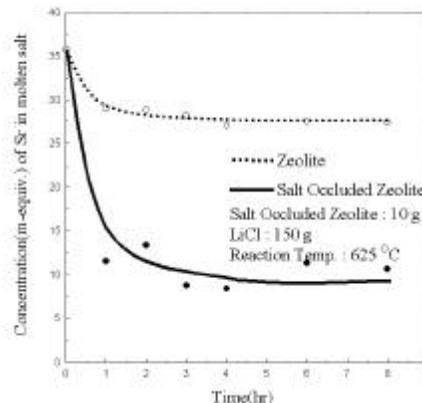


Fig. 8. Ion Exchange Kinetics of Sr Element for Salt Occluded Zeolite in LiCl Molten Salt at 625

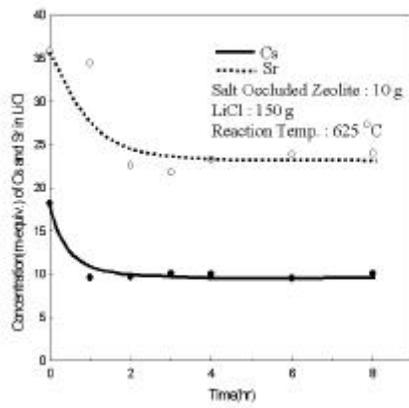


Fig. 9. Ion Exchange Kinetics of Cs and Sr Element for Salt Occluded Zeolite in LiCl Molten Salt at 625

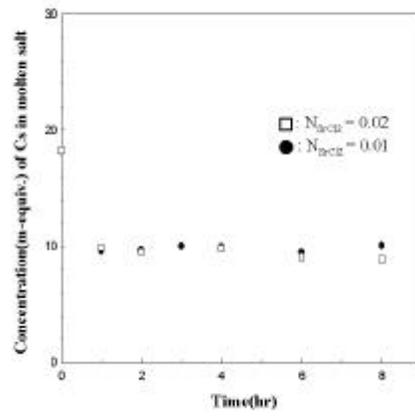


Fig. 10. Ion Exchange Kinetics of Cs Element with Sr Concentration for Salt Occluded Zeolite in LiCl Molten Salt at 625