Investigation of Leakage Trend by Ion Exchange Column Experiment in Secondary System of Nuclear Power Plant

Hyun Kyoung Ahn[1], Yoon Soo Kim[1], Woo Chan Ahn[1], Kyung Hee Lee[2], In Hyoung Rhee[1*]

[1]Soonchunhyang University, 22, Soonchunhyang-ro, Sinchang-myeon, Asan-si, Chungcheongnam-do, Republic of Korea

[2]Korea Hydro & Nuclear Ppwer Co., Ltd. Central Research Institute, 70, Yuseong-daero 1312beon-gil, Yuseong-gu, Daejeon, Republic of Korea

*ihrhee@sch.ac.kr

1. Introduction

In the secondary system of the nuclear power plant, a pH control agent (e.g., amine) is being used to reduce the corrosion of components. It is well known to be difficult to maintain the pH of the system just by injecting a pH control agent at high level by means of saturating the ion exchange resin of the secondary system de-ionizer early. In order to solve this issue, it is possible to operate the amine-breaker by operating the desalter. However, when the amine saturation operation is carried out, impurities trapped in the ion exchange resin may be released.

In this study, a cation exchange column experiment was conducted to observe the tendency of leaking impurity concentration by two different cation exchange resins.

2. Test methods and results

2.1 Impurity Leakage Tendency in Amine Saturated Resin

In the ion exchange column experiment [1], two types of column experiments were conducted as illustrated Figures 1 and 2. The experimental conditions of the injection solution are shown in Table 1.

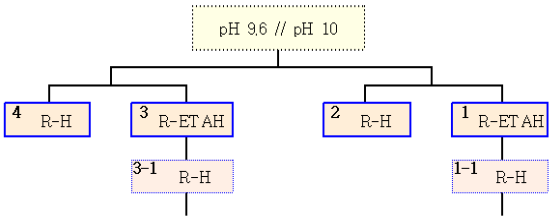

Fig. 1. R-H resin vs. R-ETAH resin(column experiment).

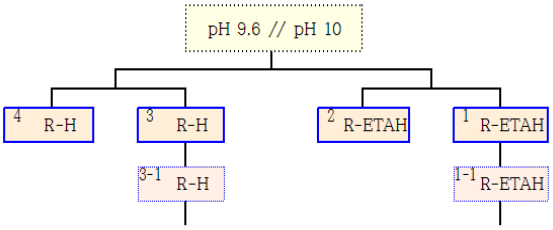

Fig. 2. R-H resin and R-ETAH resin(column experiment).

Table 1. Injection solution

	ETA		NH_3		NaCl	
	eq/L	ppb	eq/L	ppb	eq/L	ppb
pH 10	2.45 $\times10^{-4}$	14,945	2.90 $\times10^{-4}$	4,930	0 /3.42 $\times10^{-4}$ /8.55 $\times10^{-3}$	0 /20 /500
pH 9.6	5.00 $\times10^{-5}$	3,050	6.00 $\times10^{-5}$	1,020	0 /1.71 $\times10^{-4}$ /1.71 $\times10^{-3}$	0 /10 /100

The results of the leaching tendency of R-ETAH resin versus R-H resin are shown in Fiureg 3, indicating that the leakage rate of the cation exchange resin product D was lowest.

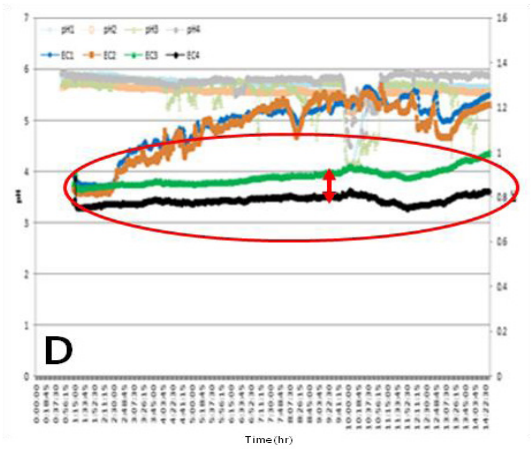

Fig. 3. Leakage trend(Product D).

The results of the leakage tendency of R-H resin product C and R-ETAH resin product D are shown in Figures 4 and 5, respectively. The leaching tendency of R-H resin (pH 10) was on product D, but Leakage tendency of product C was higest.

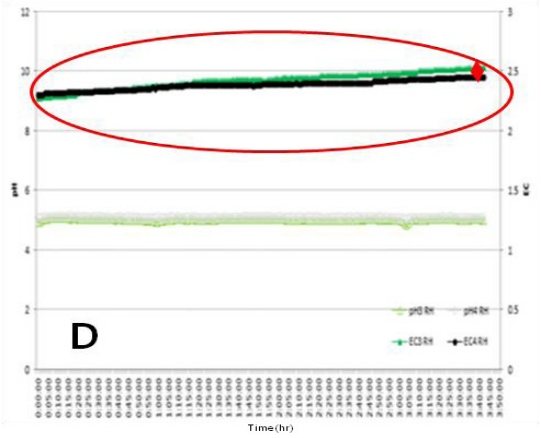

Fig. 4. Leakage trend(pH 10, Product D).

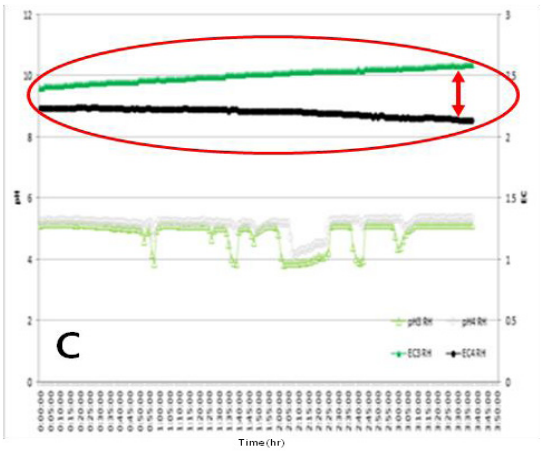

Fig. 5. R-H Leakage trend(pH 10, Product C).

3. Conclusion

Comparison of the leakage tendency of R-ETAH resin versus R-H resin was studied in pH 9.6 and 10(Injection solution conditions Table 1) to evaluate the efficiency of different resin products. It is clearly observed that the leakage tendency of product D is significantly smaller than that of other products. Based on the current test methods and results the product D provides the most efficient quality in the amine saturation operation.

ACKNOWLEDGEMENT

This work was supported by KOREA HYDRO & NUCLEAR POWER CO., LTD (KHNP).

REFERENCES

[1] Standard Test Methods and Practices for Evaluating Physical and Chemical Properties of Particulate Ion-Exchange Resins1, ASTM D1782-17.