

Progress in vapor adsorption test using molecular sieve for helium coolant purification system

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1. Introduction

An ambient molecular sieve bed (AMSB) plays a role in capturing the tritiated water, Q_2O , in the coolant purification system (CPS) which is designed to capture the tritium in helium cooling system (HCS) of the nuclear fusion reactor [1]. To confirm the function of AMSB, RAVAD (Research Apparatus for Vapor Adsorption and Desorption) was established by KAERI and KFE [2]. Main purpose of this study is to compare absorption characteristics of AMSBs according to various operation conditions.

2. Test facility and methods

Figure 1 shows the RAVAD and its main parts. Tests with a scaled-down condition were planned [3]. The scaled-down conditions are shown in Table 1



Fig. 1. Layout of the AMSB apparatus: (a) dryer, (b) vapor generator, (c) test section with a furnace and (d) vapor analyzer

Table 1. Test condition of RAVAD

Parameter	Value
System pressure	0.2 - 0.4 MPa
Temperature	25 °C
Vapor concentration	0.3 - 7 Pa ~
Superficial velocity	0.05 - 0.3 m/s

Three AMSBs were manufactured: module #1 with 16mm in length and 24mm in height (L16/H24), module #2 with 16mm in length and 64mm in height (L16/H64) and module #3 with 24mm in length and 64mm in height (L16/H64), respectively. The AMSBs were analyzed for the effects of the column length and diameter under various air flow rate and vapor concentration. The validation test observes the changes in the concentration and measure the time at which the ratio of the effluent is maintained below 1%.

3. Conclusion and further works

This experimental study focused on the adsorption characteristics of a AMSB in the CPS. The experiment was conducted on three columns of different lengths and diameters. Many cases showed stable adsorption performance for several days. Additional tests are being conducted and the database will be used for the development of the correlation. It is expected that a more reliable CPS design will experimentally be derived.

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