Supplementary Material

Effect of Storage Environment on Hydrogen Generation by the Reaction of Al with Water

Yin-Qiang Wang[a], Wei-Zhuo Gai[b], Xia-Yu Zhang[c], Hong-Yi Pan[c], Zhenxiang Cheng[d], Pingguang Xu[e], Zhen-Yan Deng[a,*]

[a]*Energy Materials & Physics Group, Department of Physics, Shanghai University, Shanghai 200444, China*

[b]*School of Physics & Electronic Information, Luoyang Normal University, Luoyang 471934, China*

[c]*Qianweichang College, Shanghai University, Shanghai 200444, China*

[d]*Institute for Superconducting and Electronic Materials, University of Wollongong, Wollongong, North Wollongong, NSW 2500, Australia*

[e]*Japan Atomic Energy Agency, Tokai, Ibaraki 319-1195, Japan*

*Author to whom correspondence should be addressed. Tel: +86-21-66134334, Fax: +86-21-66134208, E-mail: zydeng@shu.edu.cn

1. Method for storage of Al powder in different gas environment

(1) Storage of Al powder in water vapor

The heat-treated Al powder (HTA) and γ-Al_2O_3 modified Al powder (GMAP)

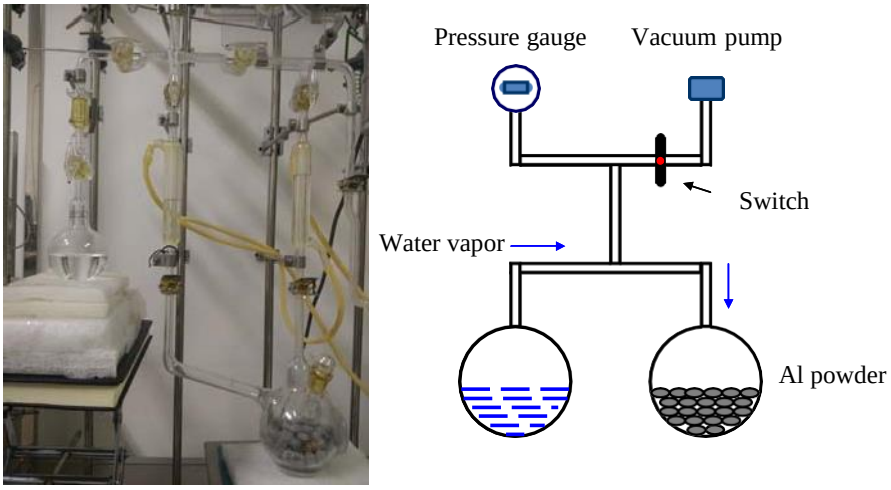

Fig. S1 The experimental equipment used for storage of Al powder in water vapor and a schematic representation of the equipment.

are put into some small plastic capsules separately in order to protect Al powder from evacuation, these capsules are not completely sealed and can exchange gas with outside. Then, the capsules are put into one glass bottle of the storage equipment (see Fig. S1, Makuhari Rikagaku Glass Co, Chiba, Japan), which has another connected bottle with water. The equipment is airtight and could keep a constant gas pressure of > 0.02 bar for more than 6 months. Before the storage experiment, evacuation is done so that air in the closed system comes out, then the switch is turned off. In this case, liquid water will evaporate until the vapor pressure reaches saturation and finally the above Al powders are stored in saturated water vapor.

(2) Storage of Al powder in oxygen or nitrogen

The vessel used for storage of Al powder in oxygen or nitrogen environment is shown in Fig. S2, which is cylindrical and made of stainless steel. The vessel has an entrance and an exit. At first, HTA and GMAP are put into some plastic bags separately, which protect Al powder from evacuation and can exchange gas with

outside, and then these plastic bags are put into the vessel. Secondly, the entrance of the vessel is switched off and evacuation is done from the exit, in order to let air inside the vessel and Al powder come out. Thirdly, the exit of the vessel is switched off, oxygen or nitrogen is filled into the vessel from the entrance until the gas pressure up to 2 bars, then the entrance is switched off. Repeat the second and third steps at least two times so that all the air in the vessel comes out and storage of Al powder is in pure oxygen or nitrogen environment. All the processes to take out the samples from the vessel are done in a large argon-filled glove box, in order to reduce the contact of Al powder with air. The storage vessel in Fig. S2 has a very good airtightness, because when we take the samples from the vessel, the oxygen or nitrogen pressure in the vessel is always higher than the atmospheric pressure even the time is over 4 months.

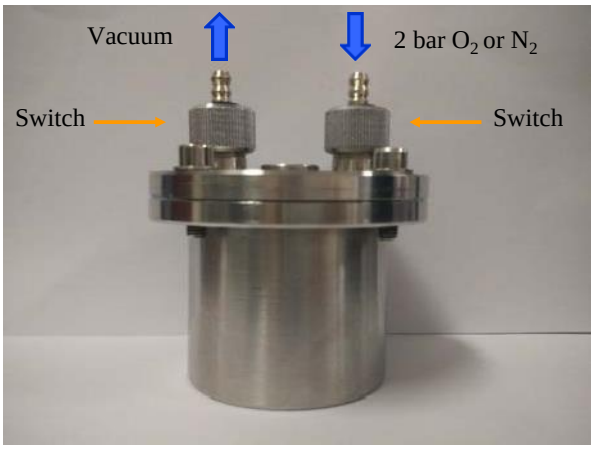

Fig. S2 The vessel used for storage of Al powder in oxygen or nitrogen environment.

(3) Storage of Al powder in air

HTA and GMAP are put into some plastic bags separately, which can exchange gas with outside. Then these plastic bags are put into a drying cabinet with a constant

humidity of ~25% for storage. All the storage experiments are done at room temperature.