

Miniaturized gas exposure devices for atom probe experiments

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Abstract

To detect hydrogen in materials at the atomic scale, atom probe tomography is now regularly used. In order to avoid cumbersome cryo-preparation to suppress diffusion, often hydrogen is charged only into the finished specimen. Here, the use of hydrogen gas over electrochemical hydrogen has the advantage that the specimen is not contaminated with an electrolyte. So far, this ‘charging’ has been done in large, expensive systems. Here, we introduce small devices that enable the exposure of atom probe specimens to hydrogen and potentially other gases, using only very small gas volumes. This enables the operation in regular laboratory environments without additional safety measures. These devices can be used to expose the specimen to hydrogen up to 10 bar / 90 °C. Higher temperatures may be attained with small changes. Validation of the success of charging with these setups is demonstrated through experiments employing deuterium charging of palladium atom probe tips.

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