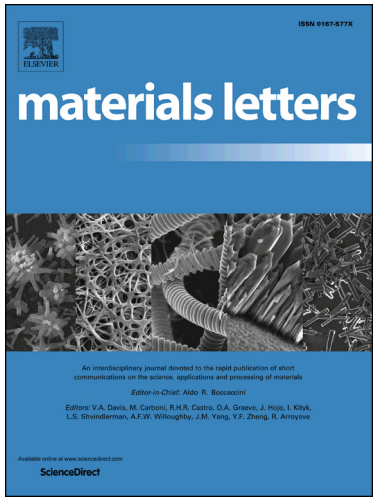

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Abstract

Tungsten (W) as one of the potential plasma-facing materials (PFMS) in the nuclear fusion reactors would suffer severe irradiation which can result in deterioration of properties. Understanding the irradiation effects on PFMS is thus critical to improve their performances. Here, the He irradiation effects is studied by focusing on microstructures of the W surfaces. As the irradiation fluence increases, surface morphologies of W become rough with abundant nano-structures, namely nanotendrils. Transmission electron microscope (TEM) images show these nanotendrils contain lots of He voids, which reveals good deformation behavior albeit brittle.

Keywords: Microstructures, Surface morphologies, Tungsten, Plasma-facing materials

1. Introduction

Due to the ultra-high melting point (3695 K), good thermal conductivity and low sputtering ratio, W has drawn great interests for applications in nuclear fusion reactor as PFMS [1]. However, as a result of deuterium-tritium reaction, the PFMS suffer from severe He irradiation which can introduce He concentration, especially at the surface areas. Consequently, the microstructures and performances of the PFMS could change unexpectedly [2].

Previous studies pointed out that, after He irradiation, the surface morphology of W had various