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P2.168 Synthesis of SiC films as tritium permeation barriers with high growth rate using a helicon wave plasma technique

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Tritium permeation loss in the fusion reactor is an important issue. Silicon carbide (SiC) is considered as an important material for Tritium permeation barriers due to its excellent properties (including low diffusivity). Steady-state and high-flux helicon-wave excited Ar/CH4/SiH4 plasma were used to synthesis SiC film onto 316L stainless steel. The surface profile and the thickness of the films were characterized by scanning electron microscopy. X-ray photoelectron spectroscopy (XPS), Infrared absorption spectroscopy and Raman spectroscopy were used to characterize the composition and microstructure. Plasma parameters such as electron density (ne), electron temperature (Te) are measured by optical emission spectroscopy and Langmuir probe. The growth rate of SiC film in different discharge mode is also investigated. The growth rate reaches a maximum value of about 3nm/s, which is attributed to the higher plasma density during the helicon wave plasma discharge. The experiments open up a new way for achieving high growth rate of SiC films at lower temperature.
Keywords: helicon-wave excited plasma, Tritium Permeation Barrier, SiC film.
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