High energy ion beam irradiation on titanium substrate in a pulsed plasma device operating with methane

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Abstract

We report the investigation of high energy ion beam irradiation on titanium (Ti) substrates at room temperature using a low energy plasma focus (PF) device operating in methane gas. The surface modifications induced by the ion beam using two different anode materials, graphite and copper, are characterized using standard surface science diagnostic tools, such as x-ray diffraction, scanning electron microscopy, energy-dispersive x-ray analysis, Raman spectroscopy and Auger electron spectroscopy. It has been found that the interaction of the pulsed PF ion beams, with characteristic energy in the 15–300 keV range, with the Ti surface, results in the formation of nanocomposite carbon structures. It is observed that the resulting ion irradiated surface morphologies are different, depending on the different anode materials, under otherwise identical operational conditions. In the case of the graphite anode the interaction of PF ion beams followed by the anode vapour with the Ti surface results in the formation of gradient layers of TiC with embedded carbon nanostructures.