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Effects of Pd ion implantation and Si addition on wettability of Al/SiC system

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Abstract

6H-SiC (0001) monocrystal substrates were implanted with 20 keV Pd ions at three doses of 5×10^{15}, 5×10^{16} and 5×10^{17} ions/cm^2 at room temperature. The surface characteristics of Pd-implanted SiC substrates were analyzed by Monte Carlo simulation software SRIM-2008 and Raman spectroscopy. The effects of the Pd ion implantation into the monocrystal substrate and of the Si additions (4.8, 11.6, 19.4 and 29.2 at.%) into Al on wettability of Al/6H-SiC system were investigated using the sessile drop technique in a high vacuum at 1323 K, and the surface and interfacial behaviors were analyzed and discussed. The experimental results showed that the equilibrium contact angle of Al/SiC system increased with increasing Pd implantation dose, which can be mainly attributed to the decreasing interfacial interactions between the Al drop and the SiC substrate. However, the Si concentration had an opposite effect on the wettability of Al/SiC system when the Si concentration was higher or less than the equilibrium Si content of Al-Si/SiC system, which can be related to the variation of σ_{SL} of Al-Si/SiC system with the Si content.

Keywords: Ion implantation; SiC; Wettability; Interfaces

1. Introduction

Silicon carbide (SiC) single crystal is one of the very important third generation semiconductor materials, which has been widely applied in the high power, high