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# The influence of helium (He) bubbles on the migration behavior of silver (Ag) and strontium (Sr) co-implanted into polycrystalline silicon carbide (SiC) during isochronal annealing.

The migration of silver (Ag) and strontium (Sr) ions co-implanted into polycrystalline silicon carbide (SiC) in the presence of helium (He) was studied using Raman spectroscopy, scanning electron microscopy (SEM), atomic force microscopy (AFM), Rutherford backscattering spectrometry (RBS), and transmission electron microscopy (TEM). 360 keV Ag ions were first implanted into SiC, followed by 280 keV Sr ions at 600 ℃ (Ag+Sr-SiC). Ag+Sr-SiC were further implanted with 17 keV He ions at 350 ℃ (Ag+Sr+He-SiC). Both samples were isochronally annealed at temperatures from 1000 ℃ to 1300 ℃ for 5 h. Implantation introduced defects in the SiC without amorphization. He implantation led to the formation of elongated He bubbles, surface blisters, and holes. Sr promoted the precipitation of the pre-implanted Ag. Annealing at 1000 ℃ initiated partial recovery of structural defects in both samples. Moreover, annealing the Ag+Sr+He-SiC from 1000 to 1300 ℃ led to loss and deep voids in the implanted region, accompanied by migration toward the surface. No significant migration of Ag and Sr was observed in the Ag+Sr-SiC after annealing up to 1300 ℃. These results suggest that He played a critical role in the migration of Ag and Sr ions.

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