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Lattice location of implanted 111Ag in 3C-SiC

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SiC is a wide band gap semiconductor with an increasing number of applications in high-temperature electronics. Similar to Si, transition metals (TMs) in SiC are the source of deep levels in the band gap, however, the knowledge on structural properties of TMs in SiC, such as possible lattice sites, is much less advanced.
In this work we report first results on the lattice site location of implanted 111Ag (7.45 d) in single-crystalline cubic (3C)-SiC, evaluated by means of the emission channelling effect. Following 30 keV low-fluence (3×1012 cm−2) ion implantation, the β− emission patterns from 111Ag implanted samples were measured with a position-sensitive electron detector around the <100>, <111>, <110> and <211> crystallographic directions. All measurements were performed at room temperature, starting with the as-implanted state and following 10 minute isochronal annealing steps up to 1075 °C in vacuum. While the data analysis is still in progress, so far we clearly identify 111Ag atoms located on two different lattice sites. In the as-implanted state, a fraction of 111Ag sits on ideal substitutional silicon sites (SSi), whereas the second fraction is located near substitutional C sites (SC) roughly 0.20 Å away from the ideal site.
Upon annealing up to 1075℃ we observe a continuous increase of 111Ag atoms fractions, sitting in both near-SSi and near-SC sites, accompanied with a progressive displacement towards their respective antibonding ABSi and ABC sites.
Although the analysis of the experimental data is ongoing, it is already clear that Ag on tetrahedral interstitial (T) sites does not play a relevant role in this system. The absence of interstitial Ag is therefore a key feature of this transition metal, not only in SiC but as well in Si [1] and Ge [2].
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