Optimized Implantation Conditions for Achieving Thin-Film Separation in SiC and Si. *

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Implantation of gaseous elements into solids can lead to surface exfoliation. This effect, in addition to wafer bonding, forms the basis of a thin-film transfer process for producing heterostructures. In particular, it has been adapted to produce silicon-on-insulator. Similarly, it has been applied to SiC, a material targeted to replace silicon in electronic applications requiring operation at high power or under harsh environmental conditions. H^+-ion induced exfoliation in Si and SiC was studied in an attempt to optimize conditions for thin-film separation, and to understand the exfoliation phenomenon. Implantation conditions investigated include H^+-ion dose and energy, sample temperature and orientation, and co-implantation to investigate synergistic effects. Results will demonstrate significant similarities as well as differences in the response of these materials to changes in the irradiation conditions. These responses will be discussed in terms of the material properties of the two semiconductors. This study demonstrates the need for such optimization in each material to yield a viable and cost efficient process.

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