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## Damage Control for Transistor Junction Engineering by using Aromatic Hydrocarbon Ion Implantation

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As the device node is getting smaller, the precise doping profile control is required in transistor. Boron is widely used as P-type dopant. It has TED (Transient Enhanced Diffusion) effect during Thermal process, which is difficult to control doping profile in small dimension. So, Carbon implant is required to suppress TED effect. Before Boron implantation, amorphous layer is also required in addition to Carbon implantation to generate shallow junction profile.

To make amorphous layer during implantation, we could use options such as higher doping, higher energy, lower process temperature, and high mass implantation. Amorphous layer could be generated by cold (< -40 degC) implant which is required special tool and maintenance. The other hands, we could use higher mass instead of monomer Carbon to generate amorphous layer. There are many kind of molecular Carbon material, but we want to select gaslike material to utilize the HCP (Hot Cathode Plasma) ion source.

In this study, we analyzed potential material for molecular Carbon to generate enough plasma for ion implantation. We could find the proper material from Aromatic Hydrocarbon for molecular Carbon implant by using HCP on existing system without vaporizer. Basic characterization is performed by TW (Thema Wave), Rs (sheet Resistance), and TEM (Transmission electron microscopy) comparing among monomer Carbon, cold Carbon and molecular Carbon. Molecular Carbon showed thicker amorphous layer than monomer Carbon and similar to cold Carbon. For the amorphous and crystal interface, molecular Carbon showed best performance than others. As results, we expect the improved device characteristic and performance by using Aromatic Hydrocarbon Ion Implantation.