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Influence of Surface Termination of Boron-Doped Diamond on Superconducting Property KEISUKE NATSUI, TAKASHI YAMAMOTO, TAKESHI WATANABE, YASUAKI EINAGA, Keio University, JST-CREST TEAM — In 2004, a heavily boron-doped diamond was found to be a superconductor Since then, a superconducting diamond has attracted considerable attention, mainly explored for fundamental properties and a theoretical basis. Meanwhile, it is known that the surface of diamond is easily modified by a chemical treatment, and the physical properties, such as surface conductivity, could be modulated through the surface modification. Here, we report modulation of superconducting properties of a heavily boron-doped diamond by tuning the surface electronic state. A heavily boron-doped diamond was prepared onto a silicon wafer substrate by a microwave plasma-assisted chemical vapor deposition method. The surface of a boron-doped diamond was changed between hydrogen- and oxygen-termination by thermal and electrochemical reactions, respectively. As a result, the critical current and the diamagnetic magnetization value could be modulated in a reversible manner between the hydrogen- and oxygen-terminated diamonds with maintenance of the superconducting transition temperature. It is assumed that the carrier density at grain boundaries would change due to the induced dipole moment via surface modification, resulting in modulation of the magnetic flux pinning effect at grain boundaries.

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