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Wear performance of Electroless Ni-W-P alloy for coating on the Diamond Powder

Today, diamond powder is mainly used as cutting tools for wafer manufacturing techniques. Among them, diamond wire saw(DWS) has advantages over conventional slurry wire saw(SWS) in terms of environmentally friendly and fast cutting speed and is currently being applied to manufacturing single crystalline silicon wafer. For the DWS process, metal-coated diamond powder is used. The main reason for coating metal on the diamond surface is to hold the diamond on the wire and prolongs the life of the diamond wire through heat interruption during the cutting process.

Electroless deposition method, which is cheap way for uniform coating are mainly used to deposit metal on the surface of the diamond powder. Electroless Ni-P have been widely researched because of their properties such as hardness, wear resistivity and corrosion resistivity. Addition of tungsten in Ni-P electroless deposition can improve these characteristics.

In this study, the properties of electroless Ni-W-P thin film on the diamond powder with different parameters (temperature, pH, surfactant etc.) were studied. The surface morphology, structure and composition of the Ni-W-P thin film were examined using field effect scanning electron microscope(FE-SEM) and energy dispersive spectrometer(EDS). The concentration of sodium tungstate was increased from 0 to 0.2M to obtain Ni-W-P films containing various W and P contents which were characterized using X-Ray Diffraction(XRD). Also, the corrosion resistivity was observed using potentiodynamic polarization curve with the 3.5% NaCl solution. Hardness tests for measuring wear resistivity were performed using Nano Test Vantage Platform.

Primary author(s) : Mr MOON, Kyoungsoon (Department of Materials Science & Chemical Engineering, Hanyang University); Prof. YOO, Bongyoung (Department of Materials Science and Engineering, Hanyang University)

Co-author(s) : Prof. CHO, Mann-Ho (Department of Physics, Yonsei University); Prof. PARK, Tae Joo (Department of Materials Science & Chemical Engineering, Hanyang University); Prof. KIM, Hyounghub (School of Advanced Materials Science and Engineering, Sungkyunkwan University)

Presenter(s) : Mr MOON, Kyoungsoon (Department of Materials Science & Chemical Engineering, Hanyang University)

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