

AD-A231 555

ONR

Progress Report

7/1/90 - 12/30/90

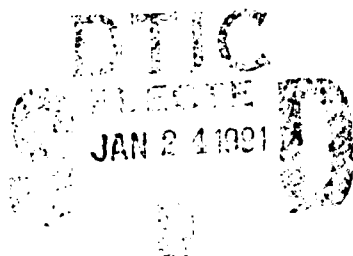
Karen K. Gleason

N00014-90-J-1901

1990

Artifact Diamond Characterization

Three CVD diamond films were produced in a hot-filament reactor using acetone as the carbon source. The acetone was enriched 33% at the methyl carbon, and the total gas-phase concentrations were 5.3%, 6.4%, and 7.4%. Static solid-state NMR measurements of hydrogen concentration, sp^2/sp^3 carbon bonding environments, and carbon-13 spin-lattice relaxation have been made on these films while they remain intact on their substrates. The hydrogen concentration was found to be below 1 at. % in each film. Increasing sp^2 content is found with increasing gas-phase carbon concentration. Ongoing measurements are aimed at understanding the sp^3 region of the NMR spectra and its relationship to Raman measurements of these films. An increased concentration of defect centers decreased the spin-lattice relaxation time constant from 18 s to 1 s as the gas-phase carbon concentration increased.



A-1

Massachusetts Inst. of Tech.,
Cambridge

Statement "A"; Title Should Read
"Artifact Diamond Characterization"
per Telecon Max Yoder. Office of
Naval Research/Code 1114SS
VHG 1/22/91

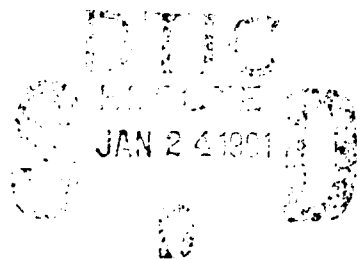
098

DNR
Progress Report
7/1/90 - 12/30/90
Karen K. Gleason
N00014-90-J-1901

1990

Artifact Diamond Characterization

Three CVD diamond films were produced in a hot-filament reactor using acetone as the carbon source. The acetone was enriched 33% at the methyl carbon, and the total gas-phase concentrations were 5.3%, 6.4%, and 7.4%. Static solid-state NMR measurements of hydrogen concentration, sp^2/sp^3 carbon bonding environments, and carbon-13 spin-lattice relaxation have been made on these films while they remain intact on their substrates. The hydrogen concentration was found to be below 1 at. % in each film. Increasing sp^2 content is found with increasing gas-phase carbon concentration. Ongoing measurements are aimed at understanding the sp^3 region of the NMR spectra and its relationship to Raman measurements of these films. An increased concentration of defect centers decreased the spin-lattice relaxation time constant from 18 s to 1 s as the gas-phase carbon concentration increased.



DISTRIBUTION STATEMENT A

Approved for public release
Distribution is unlimited