Abstract Submitted
for the GEC20 Meeting of
The American Physical Society

Penetration of hydrogen atoms and termination of dangling bonds in amorphous carbon films HIROKI KONDO, YASUYUKI OHASHI, TAKAYOSHI TSUTSUMI, KENJI ISHIKAWA, MAKOTO SEKINE, MASARU HORI, Nagoya University — The various properties of amorphous carbon (a-C) films have been extensively studied with the expectation of a wide range of applications, such as tribological coatings, etching masks, and so forth. One of the general issues of a-C is how to terminate dangling bonds. In this study, to clarify the reaction of H atoms in the a-C films, a penetration of H atoms and termination of dangling bonds were investigated using an in-situ electron spin resonance (ESR) measurement system. 50 or 100 nm-thick a-C films were grown by a plasma-enhanced chemical vapor deposition system. The H radical irradiation for 5 minutes under 100 Pa, 30 sccm of H_2 flow rate, and 50 W of microwave power, and the in-situ ESR spin density measurement were repeated alternately. The spin densities decreased from 0 to 15 minutes, then saturated. Converting to areal density, they decreased by the same amount regardless of the film thickness. This means that the H atoms penetrated to a certain depth and inactivated the defects. Calculating based on the initial defect density, it corresponds to terminating the whole defects in the 5 nm-thick regions. This result indicates that the dangling bonds in the a-C surface can be terminated by H atoms at room temperature.

Hiroki Kondo
Nagoya University

Date submitted: 17 Jun 2020 Electronic form version 1.4