In Situ Spectroscopy and Microscopy Focus Topic
Room: East Exhibit Hall - Session IS-TuP

In Situ Spectroscopy and Microscopy Focus Topic Poster Session

IS-TuP1 In Situ Infrared Spectroscopy of Oxidation Process of Amorphous Carbon Film, Depending on Substrate Temperatures, ***M. Shinohara***, *Y. Takaki, K. Hara, Y. Takami, Y. Matsuda, H. Fujiyama,* Nagasaki University, Japan

There has been much interest in amorphous carbon films because they have a lot of useful properties: mechanical hardness, chemical inertness, and changeable electrical properties. The films can be deposited at low temperatures by using plasma process. The films have been used as coating materials for mechanical apparatus. The property of the film surface can be change with the addition of the other atoms on the surface. The addition of oxygen atoms to the surface leads the surface hydrophilic. The hydrophilic property on the surface has advantages to the further surface treatment. Therefore, it is important to understand the oxidation process of amorphous films. One of the effective oxidation methods is oxygen plasma exposure. We investigated the plasma oxidation process with in-situ infrared spectroscopy in multiple internal reflection geometry (MIR-IRAS). In this presentation, we focus on the dependence of oxidation process on the substrate temperatures. Infrared spectroscopic studies indicated that the oxygen plasma exposure induced the generation of OH components in the film. It means that carboxyl group would be formed by the exposure. With the increases of the substrate temperatures, the formation of OH components in the film was suppressed; moreover, the hydrophilic property was decreased with the substrate temperatures. On the other hand, the etching rate due to the oxygen plasma exposure was increased with the substrate temperatures. It is suggested that the etching rate is increased with substrate temperature, compared with the preservation of the OH components in the film.

IS-TuP3 In Situ TEM Studies of Nanoparticle Growth in a Fluorozirconate (ZBLAN) Glass Matrix, ***J. Johnson***, University of Tennessee Space Institute

ZBLAN glass-ceramic materials are being developed as x-ray imaging plates. The materials are doped with europium and chlorine and can be heat treated in such a way that they form a novel nanocomposite material containing barium chloride nanocrystals, with the ability to convert x-rays into stable electron-hole pairs. The image can be read out afterwards with a scanning laser beam in a photostimulated luminescence process.

The ZBLAN glass only acts as an imaging plate upon annealing. As the annealing temperature and annealing time are increased, so a higher degree of nucleation of $BaCl_2$ crystallites inside the glass matrix is observed. As a result, more crystallites are available to incorporate Eu^{2+} and hence increase the fluorescence intensity. However, a higher annealing temperature and a longer annealing time also lead to a larger degree of crystal growth, resulting in bigger nanoparticles. This leads to a decrease in spatial resolution of a ceramic-glass storage phosphor. The optimal annealing condition thus needs to compromise between the fluorescence intensity and the spatial resolution.

Here we present *in situ* TEM studies of ZBLAN glasses, being carried out to further understand the growth of nanoparticles inside a glass matrix under various heating conditions.

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