

Direct observation of chemical structure changes of butyl tin oxo cluster thin film upon extreme ultraviolet irradiation

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The importance of extreme ultraviolet(EUV) photoresist has been emphasized in the semiconductor industry and advanced experimental method are required to attain a fundamental understanding of the reaction mechanism in photoresists exposed to EUV irradiation. Soft X-ray spectroscopy is useful because it provides information about the chemical and elemental composition behavior of a photoresist before/after EUV irradiation. In the present work, scanning photoelectron microscopy (SPEM) is used to probe the change in the local chemical structure of a photoresist molecule, butyl-tin-oxo-cluster (B-TOC, $\{(\text{BuSn})_{12}\text{O}_{14}(\text{OH})_6\}(\text{O}_3\text{SC}_6\text{H}_4\text{CH}_3)_2$) after EUV irradiation. We directly measured the change in elemental composition of the B-TOC as a result of EUV irradiation.

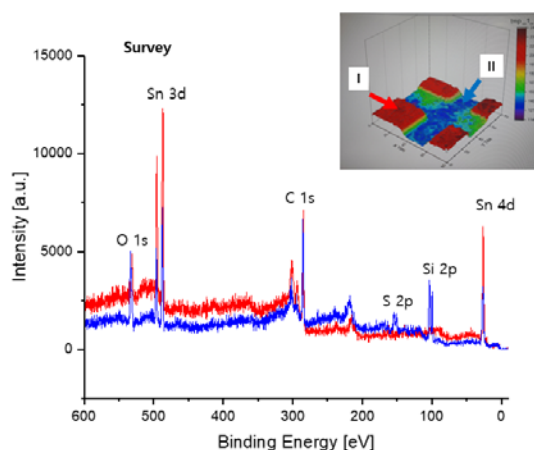


Fig. 1. Local chemical analysis using SPEM on an EUV-patterned B-TOC sample after the sample was development using toluen. Here, the exposure level reached to 480 mJ/cm². Survey spectrum I (blue) was recorded at a non-EUV-irradiated area, and survey spectrum II (red) was recorded at an EUV-irradiated area.