**Various SEM observation methods for Wet samples using ASEM and high vaccum SEM with ionic liquid IL1000**

Sakaue, M.[1], Miyoshi, S.[1], Nakabayashi, M.[1], Ominami, Y.[1] and Shiono, M.[2]

[1] Hitachi High-Technologies Corp., Japan, [2] Hitachi High-Technologies Corp, Japan

Mari Sakaue[1], Saori Miyoshi[1], Masamichi Shiono[1], Makoto Nakabayashi[1], Yusuke Ominami[1]

1Hitachi High-Technologies Corp.

In general, for SEM observation, it is necessary for wet samples to be treated with several types of preparation solvents or to use the cryo method to freeze so as to maintain their shape under vacuum. The focus of this study is to achieve wet sample observations using simple observation methods and sample preparation. Observation of wet samples using both tabletop atmospheric pressure SEM (ASEM) and high vacuum SEM with ionic liquid IL1000 sample preparation were considered here.

Hitachi released a novel ASEM technique for observing samples that are present in ambient (atmospheric) pressure [1]. In the ASEM system, environment in the specimen chamber can be kept in ambient air condition, while the electron source remains under vacuum by separating them with a SiN membrane. This system enables to observe wet, liquid, and even bulk samples. However, the membrane for separating the ambient environment from the vacuum is often covered with moisture and affects SEM observation. Hence, a cooling stage to 1 degree C is utilized in ASEM to help suppress the evaporation, allowing clear observation of the wet samples.

On the other hand, as an approach to observe wet samples in high vacuum, a method using ionic liquid IL1000 which has high hydrophilicity and molecular structure similar to choline of biological substance has been reported [2]. This is a preparation technique where the sample is soaked in the IL1000 to maintain the structure by enhancing its conductivity. Although it is effective for plant samples, it is not applicable for all of the wet samples. Therefore, after the treatment with IL1000, the cooling stage is used to observe the sample. This method even made the observation of plants and polymer materials with high moisture content possible. In this study, both ASEM and IL1000 treatment were proved effective in shortening sample preparation time and allowing simple observation of wet samples.

[1] Y Ominami et al., Microscopy, **64**, 97-104 (2014)

[2] M. Sakaue et al., JSM2013 ,21-P28, (2013)