

Type of presentation: Poster

IT-4-P-3106 SEM observation of several biological samples using a hydrophilic asymmetrical tetraammonium-type room temperature ionic liquid as a visualizing agent

ABE S.¹, KAWAI K.², YOSHIDA Y.¹

¹Graduate School of Dental Medicine, Hokkaido University, Sapporo, Japan, ²Miyoshi Oil & Fat Co., Ltd., Tokyo, Japan

Email of the presenting author: sabe@den.hokudai.ac.jp

A room temperature ionic liquid (RTIL) is an organic salt that is liquid at room temperature and has specific physical properties such as noncombustibility, no vapor pressure, high heat resistance, and high ionic conductivity. These unique properties have led many researchers to study the application of ionic liquids in various fields including electronics and chemistry. Kuwabata et al reported that they had succeeded in using RTILs for electroconductive-pretreatment of some samples for scanning electron microscopy (SEM). Because RTILs have electrical conductivity and very low vapor pressure, they can maintain a liquid state even in vacuum such as in an SEM sample chamber. Thus, they can act as visualizing agent for SEM observation. Some types of RTILs, such as imidazolium salts, pyrimidinium salts and ammonium-type salts, have been investigated for the electroconductive pretreatment.

To apply this technique for wet biological samples, we used a novel asymmetrical tetraammonium-type RTIL (HILEM IL1000, Hitachi High-Technologies Corp., Tokyo, Japan). It has chemical structure similar to a choline, which is a bioactive compound. Its properties such as high fluidity, hydrophilicity and biocompatibility can allow using as the agent for SEM observation of biological samples. To elucidate usefulness of RTIL pretreatment, we investigated the conductivity pretreatment for SEM observation of the novel tetraammonium-type RTIL (IL1000). By immersion in an IL1000 solution, clear SEM images of several types of biological samples were successfully observed. We also succeeded in visualization of some bio samples, such as protozoans, red blood cells and bacteria, using IL1000 without dilution. In particular, the size of red blood cells pretreated with IL1000 was in good agreement with that of optical microscopic (OM) observation. When they were treated with traditional method, the obtained SEM images were shrunken compared with those in OM observation. Thus, these results suggested that the tetraammonium-type RTIL used in this study (IL1000) was suitable for visualizing of biological samples for SEM observation as a "living" morphology. In addition, treatment without the need for dilution can obviate the need for adjusting the RTIL concentration and provide for a rapid and easy conductivity treatment for wet biological samples.