Thursday Afternoon Poster Sessions

In Situ Microscopy and Spectroscopy Topical Conference
Room: Southwest Exhibit Hall - Session IS-ThP

In Situ Microscopy and Spectroscopy Topical Conference Poster Session

IS-ThP2 Surface Studies of Ionic Liquids and Their Interaction with Water and CO_2, ***A.M. Margarella***, *T.M. McIntire, M.H. Cheng,* University of California, Irvine, *H. Bluhm, Z. Lui,* Lawrence Berkeley National Laboratory, *J.C. Hemminger*, University of California, Irvine

Ionic liquids are substances composed entirely of ions which have a low melting point, typically below 100° C, and other unique properties such as very low vapor pressure. These properties, in addition to ionic conductivity, make them useful as solvents for a number of applications, such as gas separation and solar cells. Using Ambient Pressure X-ray Photoelectron Spectroscopy (AP-XPS), the surface composition of different room temperature ionic liquids has been investigated. AP-XPS offers the advantage of doing photoelectron spectroscopy under higher pressures, up to a few torr, so the sample can be exposed to a variety of chemical environments. The AP-XPS used in these experiments is at the Advanced Light Source synchrotron facility. Utilizing synchrotron radiation, depth profiles of the elements in the compounds can be obtained by varying the photoelectron kinetic energy. We first investigated the surface composition of imidazolium halides under humid conditions; our results indicate that with added water vapor in the chamber, up to 15% relative humidity, the surface composition does change slightly. Higher relative humidity environments are currently being explored. The effect of water vapor on the surface of ionic liquids is important because many ionic liquids are hygroscopic, and when using them in applications, it is difficult to keep them dry. Using AP-XPS, we are also exploring the effect of CO_2 on the depth profiles of the ionic liquids. Ionic liquids have the potential to be used for CO_2 capture because the solubility for CO_2 is generally high and, when compared to other absorbents, the ease of recovery is straight-forward. For this application, the surface plays an important role in this process because the surface of the ionic liquid is the first part that interacts with the gas stream containing CO_2. Depending on the nature of the ionic liquid, it can either dissolve the CO_2 or react with it to form a carbamate. Additionally, we will investigate the role of water on the interaction with CO_2. Near Edge X-ray Absorption Fine Spectroscopy (NEXAFS) will also be used to study these interactions. By combining the surface science techniques XPS and NEXAFS, we can understand the role of different ionic liquids in capturing CO_2.

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