Abstract ID : **39**

In situ observation of an atomically modified glassy carbon surface: From synthesis of an Fe-N-C catalyst to intrinsic combined reactions of hydrogen dissociation and the oxygen reduction reaction

Content

We carried out an in situ ambient-pressure X-ray photoemission spectroscopy (AP-XPS) study on the catalytically active surface of glassy carbon subjected to nitrogen-ion implantation and subsequent iron deposition. We also used argon ions to intentionally induce carbon defects on the glassy carbon to compare the effects of substrate defects. Notably, water was produced spontaneously on the modified glassy carbon surface. We compared and clarified the surface structures of the samples in situ by AP-XPS and observed some differences among the pristine glassy carbon (PGC), Fe and N co-doped PGC, Ar-sputtered glassy carbon (AGC), and Fe and N co-doped AGC samples. These differences reveal the potential active site of oxygen reduction reaction and the inherent source for spontaneous dissociation of hydrogen molecules on the atomically modified surface of glassy carbon. The analysis illuminates the new property of glassy carbon itself and offer new direction of Fe-N-C catalyst preparation.

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Track Classification: Surface science/chemistry