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Electrochemical and SEIRAS Studies of Urea and Biuret Adsorption on Polycrystalline Gold

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Abstract

The potential dependent adsorption of urea and its self-condensation product, biuret, have been studied on polycrystalline gold electrodes using electrochemical and in situ infrared spectroscopy. Voltammetry reveals that biuret displays a wider double-layer region compared to its parent compound and can only be oxidized at potentials that overlap with Au oxidation. Chronocoulometric measurements indicate that the adsorption of biuret is stronger than that of urea and the surface coverage is potential dependent. Surface enhanced infrared absorption spectroscopy (SEIRAS) experiments have been performed on both urea and biuret adsorption from neutral solutions made from heavy water. Urea provides low intensity IR signals consistent with relatively weak adsorption over a very restricted potential domain whereas biuret is spectroscopically much more pronounced. Analysis of the SEIRAS results support at least two distinct configurations of adsorbed biuret involving oxygen coordination to the metal surface. At the limit of the positive potentials studied spectroscopic evidence of the adsorption of partially oxidized biuret (ureayl-type species) is provided.

Keywords: *urea, biuret, adsorption, polycrystalline gold, surface enhanced infrared absorption spectroscopy, chronocoulometry, Gibbs excess.*