

A structural and chemical study of the influence of the substituent on the reactions of amines at Cu(110) surfaces.

Philip R. Davies, Dyfan Edwards, Martin Parsons and Darren Richards
School of Chemistry, Cardiff University
daviespr@cf.ac.uk

The amine-surface interaction is important in systems ranging from chiral catalyst modification to adhesion. This study explores the influence of the amine substituents on surface reactions from a chemical and structural point of view using a combination of STM and XPS. Aniline mirrors the chemistry of ammonia closely, reacting with surface oxygen to form an imide type species with the elimination of water. The ordering of the imide product at the surface is more complex than in the case of ammonia however, with a variety of structures produced depending on the details of the experiment. The reasons for this changing behaviour are discussed together with the observation that, where ordered structures are present the in-situ XPS data shows twice as many phenyl groups as the STM data. In contrast, to aniline the alkyl amines interact with surface oxygen to form an intermediate complex with a characteristic p(3x1) structure similar to that seen with pyridine. The complex is meta-stable at room temperature and decomposes with time to leave a clean Cu(110) surface.

We discuss these different behaviours in terms of the basic strength of the amines, the NH bond strength and steric effects of the substituents groups.