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**The structure of water/hydroxyl phases at metal interfaces**

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On all but the least reactive metals, the first contact layer with water is a mixture of water and hydroxyl, often formed by spontaneous dissociation [1]. Understanding the composition and stability of these layers is a key step in describing both the wetting and the redox behavior of the surface. Here we discuss the wetting of Cu(110) and the formation of mixed water-hydroxyl layers by reaction with adsorbed O. This surface does not conform to the traditional hexagonal symmetry associated with an ice Ih, and the hydrogen bonding structure must accommodate to the surface symmetry. A number of unusual structures are seen, including 1D chains of interlocking pentagons [2], an intact 2D network with a (7x8) unit cell at higher coverage [3] and several partially dissociated structures, including both 1D and 2D phases [4]. The composition of these structures and hydrogen bonding arrangements will be discussed, highlighting the way changing the composition and relative metal-adsorbate and adsorbate-adsorbate interactions drives the structural rearrangement of these phases.

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[2] J. Carrasco et al. Nat. Mat., 8, 427 (2009).

[3] T. Schiros et al., Chem. Phys. Lett., 429, 415 (2006).

[4] M. Forster et al., submitted.