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Iron chemistry at aqueous interfaces by near edge X-ray spectroscopy¹ DAVID VAKNIN, WENJIE WANG, ALEX TRAVESSET, Ames Laboratory, and Department of Physics, Iowa State University, Ames, Iowa 50011, IVAN KUZMENKO, X-ray Science Division, Advanced Photon Source, Argonne National Laboratory, Argonne, IL 60439 — Employing synchrotron X-ray absorption near-edge spectroscopy (XANES) combined with X-ray fluorescence (XF) and reflectivity (XR) techniques, we monitor the state of ferrous and ferric iron as it binds to charged carboxylic and phosphate groups. By subphase pH manipulation, arachidic acid and dihexadecyl phosphate monolayers can provide a range of surface charge density from nearly charge-neutral to a fully charged monolayer to which iron ions are attracted from solutions. Analysis of our results from fluorescence show that the driving forces attracting Fe^{3+} and Fe^{2+} to the interface originate from chemical interactions and electrostatic, respectively. XANES shows that the electronic and geometric structure of iron complexes at interface are different from those in the bulk. Moreover, the XANES results demonstrate that valence state and bonding of the interfacially bound Fe^{3+} and Fe^{2+} are practically indistinguishable. This, we argue, is due to the versatility of iron ions in behaving as electron acceptors (Fe^{3+}) or as donors (Fe^{2+}).

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