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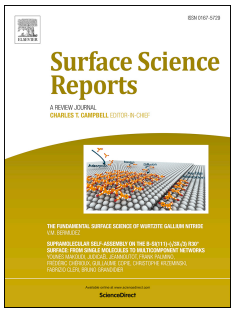

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Lab-based Ambient Pressure X-ray Photoelectron Spectroscopy from Past to Present

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Abstract

Chemical interactions which occur at a heterogeneous interface between a gas and substrate are critical in many technological and natural processes. Ambient pressure X-ray photoelectron spectroscopy (AP-XPS) is a powerful spectroscopy tool that is inherently surface sensitive, elemental and chemical specific, with the ability to probe sample surfaces in the presence of a gas phase. In this review, we discuss the evolution of lab-based AP-XPS instruments, from the first development by Siegbahn and coworkers up through modern day systems. A comprehensive overview is given of heterogeneous experiments investigated to date via lab-based AP-XPS along with the different instrumental metrics that affect the quality of sample probing. We conclude with a discussion of future directions for lab-based AP-XPS, highlighting the efficacy for this in-demand instrument to continue to expand in its ability to significantly advance our understanding of surface chemical processes under *in situ* conditions in a technologically multidisciplinary setting.

Keywords: Photoemission, operando, surface, interface, uptake, catalysis.