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Novel protocol for highly efficient gas-phase chemical derivatization of surface amine groups using trifluoroacetic anhydride

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Abstract

In the current work, chemical derivatization of amine (NH₂) groups with trifluoroacetic anhydride (TFAA) as an analytical method to improve the information scope of x-ray photoelectron spectroscopy (XPS) is investigated. TFAA is known to successfully label hydroxyl (OH) groups. With the introduction of a newly developed gas-phase derivatization protocol conducted at ambient pressure and using a catalyst also NH₂ groups can now efficiently be labelled with a high yield and without the formation of unwanted by-products. By establishing a comprehensive and self-consistent database of reference binding energies for XPS a promising approach for distinguishing hydroxyl from amine groups is presented. The protocol was verified on different polymers, including poly(allylamine), poly(ethyleneimine), poly(vinylalcohol) and chitosan, the latter one containing both types of addressed chemical groups.

Keywords

Chemical derivatization; XPS; Trifluoroacetic anhydride, Amino group; Hydroxyl group; Polymer;

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