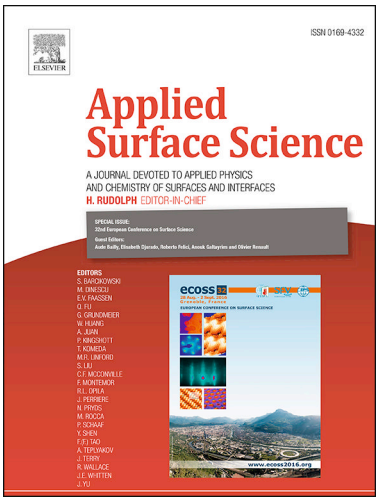

Short Communication

Reliable determination of chemical state in x-ray photoelectron spectroscopy based on sample-work-function referencing to adventitious carbon: Resolving the myth of apparent constant binding energy of the C 1s peak

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Reliable determination of chemical state in x-ray photoelectron spectroscopy based on sample-work-function referencing to adventitious carbon: Resolving the myth of apparent constant binding energy of the C 1s peak

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Highlights

- C 1s peak of adventitious carbon (AdC) is often used for binding energy (BE) referencing in XPS
- We analyze AdC layers on metals, nitrides, carbides, borides, oxides, and oxynitrides
- BE of C 1s peak E_B^F varies from 284.08 to 286.74 eV depending on the substrate
- E_B^F of C 1s peak correlates to the sample work function ϕ_{SA}: $E_B^F + \phi_{SA}$ = constant
- electronic levels of the AdC layer align to the vacuum level
- complementary measurement of ϕ_{SA} is necessary for BE referencing based on C 1s peak

Abstract

The accuracy of chemical-state determination by *x*-ray photoelectron spectroscopy used in contemporary advanced materials research relies on a trustworthy binding energy (BE) referencing method. The C 1s peak corresponding to C-C/C-H bonds of adventitious carbon (AdC), present on a majority of air-exposed samples, is most commonly employed for this purpose, irrespective of whether samples are electrically conducting or not. Contrary to