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Digging into the depth of molecule coated oxide nanostructures - routes to analyse hybrid organic-inorganic nanomaterials

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Nanostructured inorganic materials are coated with organic molecules for various applications, reaching from solar energy conversion to catalysis or medical applications. Examples include UV-stable superhydrophobic zirconia surfaces that are obtained by deposition of phosphonic acid molecules in zirconia nanotubes.[1] Other examples are recently developed solar capsules, encapsulated dye sensitized solar cells based on titanium dioxide nanotubes,[2] and zirconia nanotubes designed for local, triggered drug release from implant surfaces.[3]These hybrid materials consist of a porous, inorganic oxide matrix that is modified or filled with organic compounds. However, we still lack control and understanding about the depth distribution of SAMs within the nanostructures. The analysis of the distribution of the organic compounds within the inorganic porous material is challenging, as a range of artefacts may occur during the sample preparation for analysis, or the analysis itself. To overcome these issues in depth-resolved characterization of hybrid organic-inorganic nanostructures, this study compares the possibilities given by the use of ToF-SIMS (depth profiling) alone and in combination with cross-section-polishing (CSP'n'SIMS) and focused-ion-beam (FIB'n'SIMS) cuts.

REFERENCES

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