ORE301

Plasma surface interaction and modification on the nanoscale - Towards in situ TEM studies

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Fabrication or modification of nanostructured materials and surfaces often requires plasma processes. The understanding of the interaction between plasma discharge and material itself is limited by state-of-the-art analysis only being available in an *ex situ* approach. Plasma treatment and material analysis via e.g. TEM, SEM or XPS are separated. To overcome this separation a microplasma chamber based on proof-of-principle experiments by Tai *et. al* [1] for *in situ* plasma treatment inside a TEM is in development. Thus, enabling the direct study of the plasma-surface interaction.
The effects of plasma treatment on highly porous, functional materials such as tetrapodal ZnO [2], Aerographene [3] and aero GaN [4] are investigated in an *ex situ* approach using TEM analysis. Plasma induced nitriding and, thus, functionalization of Aerographene was successfully achieved by treatment in a capacitively-coupled RF N_2 plasma. The effects of H_2 and H_2/O_2 mixture plasma treatment on t-ZnO and the residual ZnO layer on the inside of aero GaN were investigated, too.
Furthermore, the plasma permeability of aero materials is investigated by using the surface activation of polymers and subsequent change in contact angle as marker for plasma penetration. Finally, we present an outlook for adapting the *ex situ* experiments to our *in situ* microplasma chamber as well as preliminary results.
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Keywords
in situ techniques
microplasma
TEM