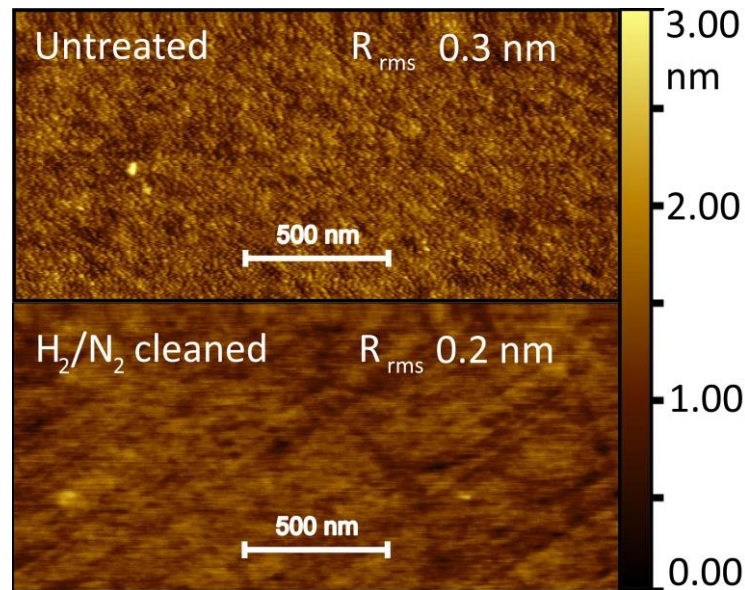


Secondary Ion Beam Processes

OCRICOM specializes in the **development of secondary ion beam process for optical coating applications**. Our diverse range of cleaning processes and the capability to develop customized solutions for customers' needs is **first-class and unique in the field**. This technical note highlights the benefits of utilizing the secondary ion beam in the ion beam sputtering (IBS) processes.

I. Surface Cleaning

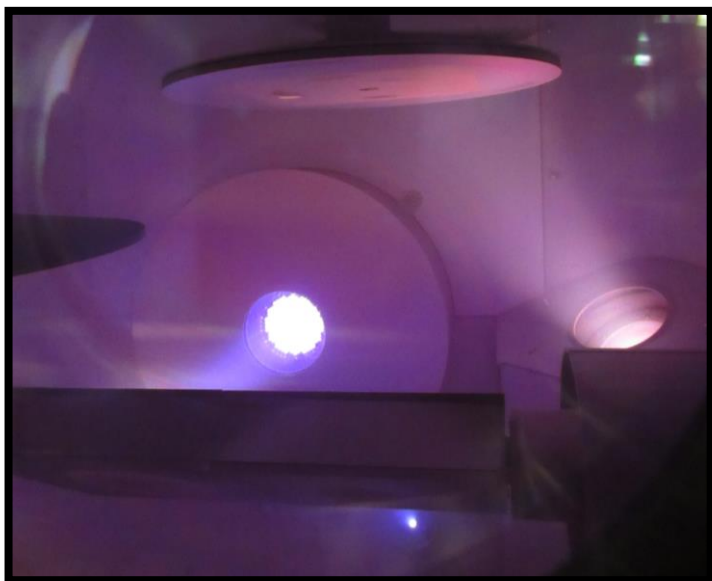
- ❖ In-situ secondary ion beam cleaning **improves adhesion** and smoothens the surface-coating interface which **mitigates optical losses**.
- ❖ With an optimized process you **know the surface state** you are applying the optical coating on, which is **invaluable** in the **product development**.
- ❖ Some process options:
 - I. **O₂** cleaning for removing organic residues.
 - II. **O₂/Ar** cleaning to remove sub-surface damage region of e.g. glass laser optics.
 - III. **N₂/H₂** cleaning to remove native oxides and contaminants.
- ❖ Available process gas combinations are an inert gas (**N₂/Ar**) and a reactive gas (**O₂/H₂**)

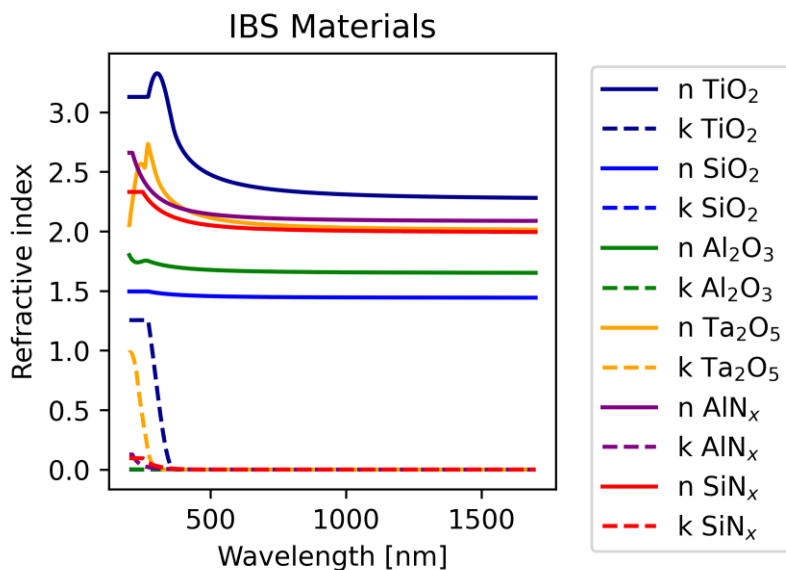


Atomic force microscope scans of untreated and processed n-GaAs surface.

II. Ion Assisted Deposition

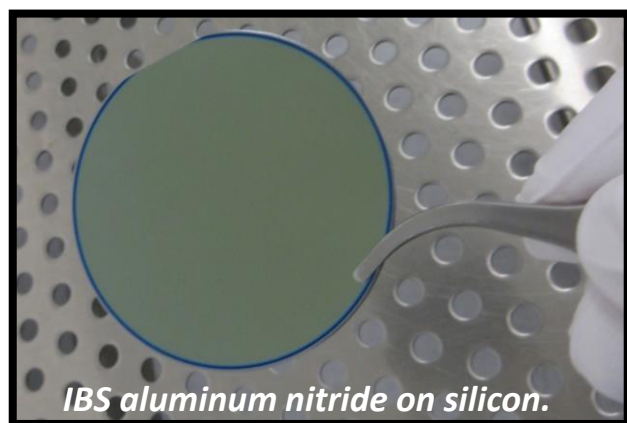
- ❖ Possibility to **deposit nitrides**, which are otherwise difficult to utilize with IBS.
- ❖ We have developed processes for **silicon nitride SiN_x** and **aluminum nitride AlN_x**. Possible to deposit titanium nitride TiN and tantalum nitride TaN with the same principles.
- ❖ **Enhances the process optimization** capabilities for the regular oxides (SiO₂, TiO₂, Al₂O₃, Ta₂O₅).
- ❖ **Passivation** of the reactive surfaces from further oxidation after cleaning by growing **thin nitride layer** prior utilizing the standard oxide coating process.





The additional process capabilities by the ion assisted deposition provide larger selection of available refractive indices.

- ❖ The **nitrides** can be used as **single-layer coatings**, where oxygen is unwanted or as a part of oxide/nitride **optical coatings**, such as an **antireflection coating**.
- ❖ Also **oxide/nitride hybrid materials** are possible for testing **unique and novel properties**.



More Controlled Process for Better Outcomes

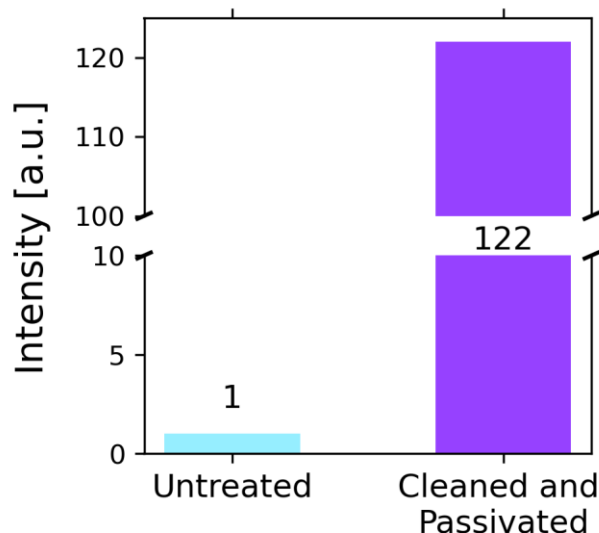
Known issues

- ❖ Conventional substrate cleaning usually involves solvents that can leave residues behind.
- ❖ Surface polishing does not guarantee pristine surface quality.
- ❖ Even the cleanest substrates accumulate organic residue from the room air due time.
- ❖ Some materials, like semiconductors, react with the atmospheric oxygen and form irregular native oxide on their surface leading to poorer performance.

Solution

- ❖ The **secondary ion beam cleaning** can **solve** these **issues** and, when combined with the right **ion assisted starting layer**, **elevates** your **process quality** significantly.
- ❖ We can help you to find **the right process** for **your application** with the experience we have with the secondary ion beam processing.

GaAs Photoluminescence at 868 nm



Improved optical quality by over a 100-fold of a GaAs-surface by N_2/H_2 cleaning and AlN_x passivation.