# Thermal lithography and plasma treated plasmonic nanostructures for applications in biosensing, electrochemistry and solar cell development.

Developing a low-cost fabrication technique empowers transferring nanotechnology from the research stage to the industrial level. This project is about moving from expensive and time-consuming techniques — such as e-beam lithography and focused ion beam milling — to thermal imprinting and plasma patterning for nano- and micro pattern fabrication. Thermal imprinting is a scalable technique that utilizes a simple mechanical deformation of a substrate's surface to create patterns. The deformation is done by utilizing a mold containing the reverse structures of interest in the appropriate size regime as seen in Figure 1a. Plasma treatment is a commonly used industrial technique (e.g. electronic- and medical devices) where a surface is chemically or physically modified by a generated plasma of a mixture or single gas. Depending on what gas or mixture that's used the surface modification will vary significantly. In Figure 1b an illustration of the technique is shown, highlighting the physical and chemical branches of plasma treatment. Techniques involved are thermal micro/nano imprinting, plasma treatment, electrochemistry, metrology including SEM & AFM, optical characterization, and spectral measurements like Raman or fluorescence. This is an on-going project where opportunities for Master's- or semester projects are available. ***The exact details of the student projects will vary depending on the state of the main project, but is tunable to match the student's schedule.***
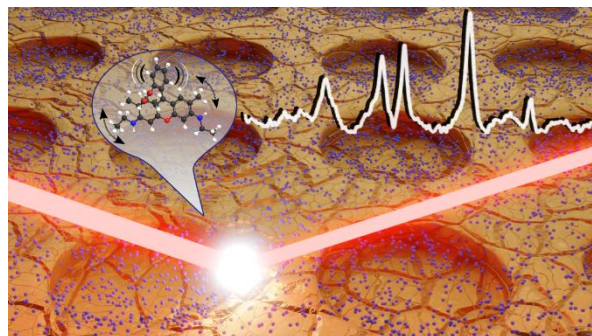
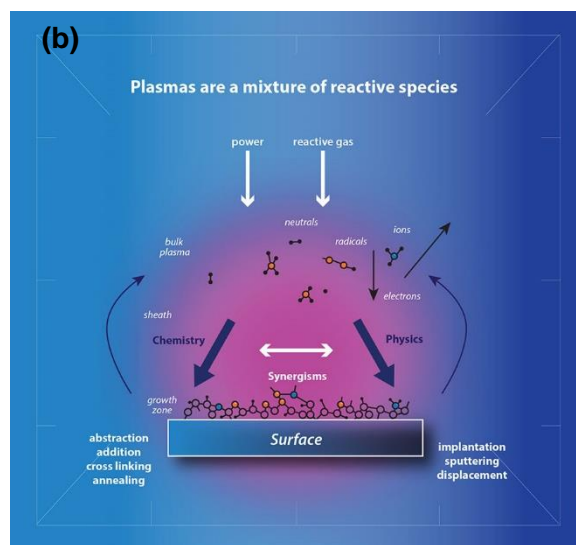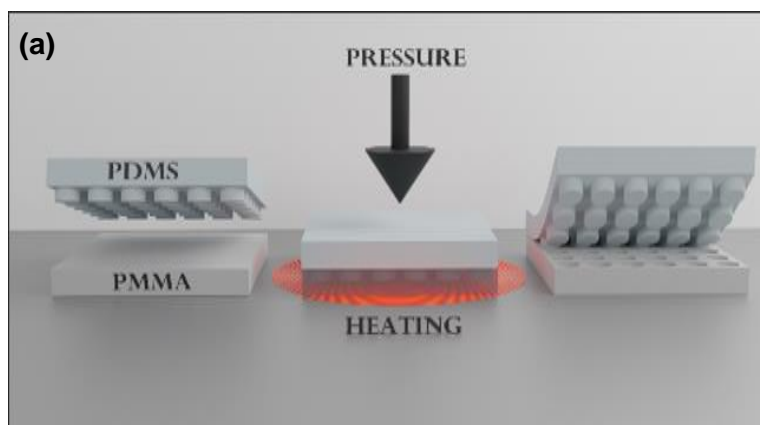***Contact one of the supervisors for more information.***

Figure 1: **(a)** Schematic illustration of the thermal imprinting procedure using a replica mold in PDMS to pattern nanoholes on PMMA. **(b)** Explanatory illustration of the plasma treatment technique.

For more information please read the following paper:

[Plasmonic metasurface assisted by thermally imprinted polymer nano-well array for surface enhanced Raman scattering](#)

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