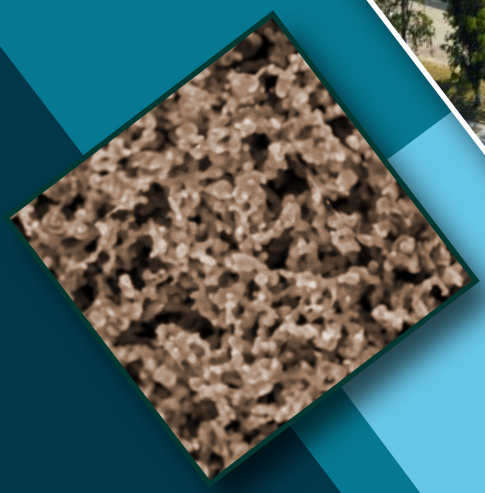
BUSINESS OPPORTUNITIES

CLICK SINTERING of AuNPs a new technique for electrochemical platforms fabrication

A fast method to produce nanoporous and conductive thin-film gold electrodes at room temperature and without post-processing.



ICN2

Institut Català de Nanociència i Nanotecnologia

APPLICATION LANDSCAPE AND NEED

Fabrication of devices by inkjet printing with nanofunctional inks has emerged as a trend over the last 10-15 years, finding applications in electronics, optics, energy, materials science, and biosensing. Most of these inks are based on metal nanoparticles (e.g. Au, Ag, and Pt) and, despite the ease of the printing procedure, this is typically followed by a time consuming post-processing step called "sintering". A plurality of sintering methods is available for the fabrication of devices, films, and materials from nanoparticles; though, they present some limitations.

The most common sintering processes require high temperatures, which prevents the use of temperature sensitive substrates such as paper and common plastics, or specialized and expensive equipment –such as UV/IR high intensity lamps, microwave generators, etc.

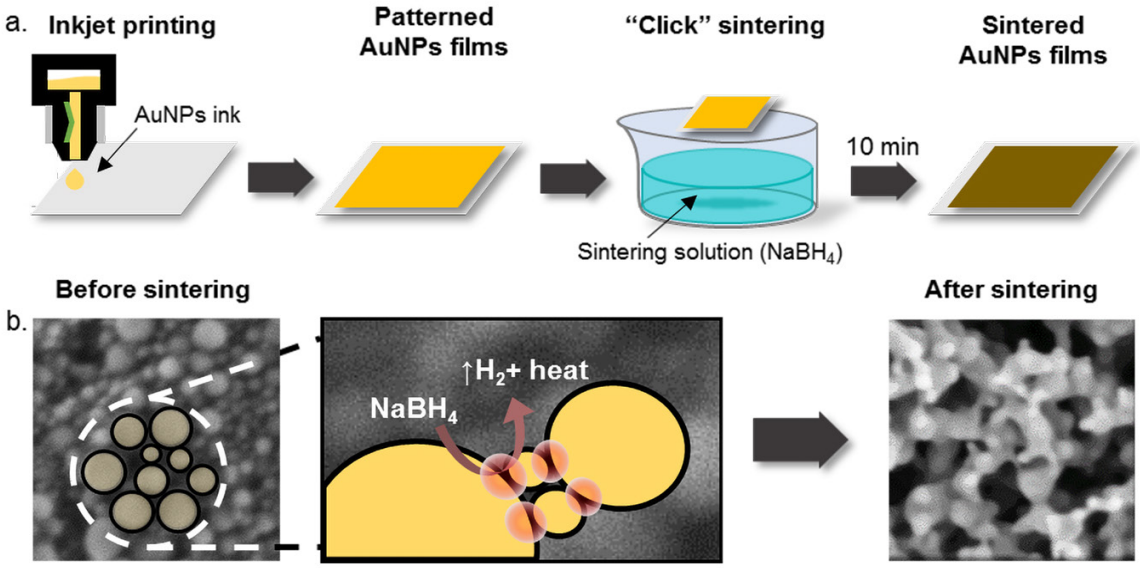
Furthermore, these methods typically produce relatively flat surfaces, collapsing the huge surface area offered by nanoparticles. This worsens the electrochemical properties of the produced materials, sensitivity, and signal.

INNOVATION

The Catalan Institute of Nanoscience and Nanotechnology (ICN2) has developed CLICK SINTERING, an innovative 2-in-1 methodology to chemically sinter inkjet-printed AuNP films at room temperature in less than 10 minutes and to nanostructure the printed film, obtaining nanoporous electrodes with high sensitivity for electrochemical biosensing.

CLICK SINTERING consists in the simple immersion of the printed devices with AuNP ink in the specific reagent for 10 minutes, agitating throughout the process at room temperature. After the washing step the electrodes are perfectly conductive and nanoporous, with an electrochemical active area more than 10 times higher than the one of commercially available screen-printed devices with the same layout and geometrical features.

The **CLICK SINTERED** devices have been tested for the simultaneous detection of two SARS-CoV-2 genes (ORF1ab and N genes), showing an extremely high response (400% signal gain). The results are currently under submission to the journal "*Biosensors and Bioelectronics*".



APPLICATIONS

The **CLICK SINTERED** electrodes can be used in any type of biosensors employing redox labels/mediators, e.g. genosensors, immunosensors, enzymatic sensors etc. The electrodes offer a very high surface-active area, which can result in an increment of immobilized bioreceptors and of active sites for the labels/mediator redox reactions.

KEY ADVANTAGES

- Rapid sintering and nanostructuring of noble metal nanoparticles films at room temperature.
- No expensive equipment needed. The sintering is performed simply by immersing the devices in a reagent.
- Can be coupled with low-cost fabrication techniques for fast prototyping of porous films for different applications.
- High nanoporosity of the films after the sintering, allowing for a huge surface-active area for immobilization of probes and electrochemical reactions.

STAGE OF DEVELOPMENT

The **CLICK SINTERING** method was tested in the laboratory for the development of more sensitive electrochemical genosensors for the detection of SARS-CoV-2 genes. The use of the same devices for the detection of heavy metals and for energy applications is under study.

New ways of dispensing the reagent are under study, e.g. inkjet printing and others, with the aim of making it more effective, targeting only specific areas of the printed devices and minimizing the reagent volume needed.

BUSINESS OPPORTUNITY

The ICN2 is looking for industrial partners interested in licensing the technology and/or collaborating on industrial prototyping and testing in relevant environment.

INTELLECTUAL PROPERTY: European patent application filed in June 2023.

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