3D printing in the electrochemical research: from fundamental characterization of electrodes to practical cells, sensors and catalysts

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3D printing is an outstanding manufacturing tool for prototyping customized designs at reduced time and costs, having found applications in fields such as medicine or automotive industry. The development of printable electrically conductive composite materials brought revolution to electrochemistry, with 3D printed electrodes being intensively studied from the viewpoint of charge transfer characteristics, analytical performance and stability. Bi-material 3D printing combining electrically conductive and insulating materials has enabled the manufacture of integrated electrochemical cells for sensing, synthetic and catalytic applications.
In this talk, I will summarize our recent efforts and successes in the development and manufacture of 3D printed electrochemical devices. Presented designs include cells and electrodes for mechanistic studies, electrocatalytic reactions and sensors of drugs, antibiotics, metabolites and pathogens. Additionally, a microfluidic spectroelectrochemical platform for the detection of in-situ generated reaction species (Fig. 1) and an impedimetric platform for determining (di)electric properties of liquid samples will be presented.

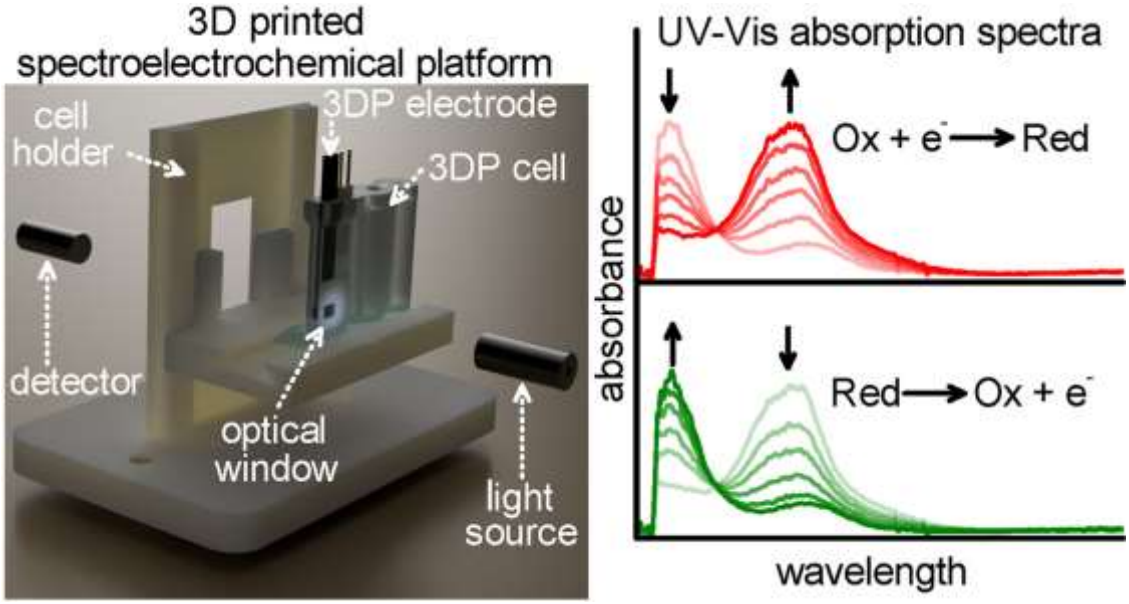

Figure 1. 3D printed spectroelectrochemical platform