3D printable polymeric MXene/composites towards catalytic applications

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Polymeric composites have been proven to have the potential to develop functional devices, employing 3D printing as an up-and-coming technique that allows to efficiently fabricate pieces with a high degree of freedom. MXenes are a family of 2D nanomaterials, usually presented in a multi-stacked form or single flakes[2], electrically conductive, hydrophilic and with great dispersibility, made from transition metal carbides, nitrides or carbonitrides[1].

The focus of this study is the inclusion of $Ti_2C_3T_x$ MXenes as additives in the polymeric matrix to give potential electrochemical or conductive properties, towards catalytic applications. Digital Light Processing (DLP) was used to shape such material in a deliberate form for the latter application, followed by the proper characterization to ensure compatibility of the MXenes, $Ti_2C_3T_x$, in the polymeric matrixes chosen, based on BPA-dma (Bisphenol A dimethacrylate): TETRA (Pentaerythritol tetracrylate) and TMPTA (Trimethylolpropane triacrylate). For the characterization, photorheology, FTIR and XRD were done to analyze the chemical properties, later a FESEM and XPS to evaluate the dispersion and chemical content on the surfaces and 3D scanning for determining the precision of the 3D printing. Furthermore, a thermal treatment was performed on the printed samples to evaluate the electrochemical performance under reduced organic content, by LSV- Linear Sweep Voltammetry.

Figure 1. MXene/composite 3D printed structure. On the left, there is a carbonized treated sample. On the right, 3D scanned heatmap.

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