Conductive MXene thin films for developing highly sensitive and selective gas sensors

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MXenes are a new family of two-dimensional transitional metal carbides/nitrides with very high electrical conductivity (10,000 S/cm), and a high density of surface functionalities. Also, their excellent solubility in solvents render MXenes excellent candidates for functional films and composites toward numerous applications. In this presentation, the utilization of MXenes and their composites for highly sensitive gas sensors will be discussed. In detail, methods to control the stacking and interlayer structure of MXene thin films and their application as chemical sensors will be presented. Assembled MXene films were able to detect ppb-level VOC gases at room temperature, being more sensitive than any other reported material, which is critically important for therapeutic applications. Furthermore, the controlled intercalation of metal ions into the interlayers of MXene films dramatically increased the selectivity of MXene gas sensors toward VOCs.