The ultimate target of this project is to achieve the fabrication of MXene-laser-induced graphene (LIG) composite surfaces with enhanced electrical conductivity for virus inactivation. LIG is a technology uniquely positioned to advance applications where electrically conductive carbon coatings are required. It has been demonstrated in both air and water filtration, and anti-fouling, anti-viral, and anti-bacterial properties were observed. On the other hand, MXenes are a family of novel two-dimensional (2D) materials with superior electrical conductivity. A combination of LIG with MXenes is expected to provide much-improved surface electrical conductivity and enhanced antiviral activities. During the past 4 months of the funded project, we have successfully prepared a series of polyimide (C-P84) non-woven supported LIG air filters. The LIG was formed in-situ on the surface of polyimide fibers with a good graphitization degree. Besides, single-layer Ti3C2Tx MXene flakes with a size ranging from 100 nm to ~2 μm were synthesized in both water and ethanol, forming stable colloidal solutions with a concentration up to 200 mg/mL. Using the spray coating method, we have fabricated a series of MXene-LIG composite surfaces with different MXene loadings and flake sizes. Detailed characterizations of the structure and air filtration properties of the composite surface are to be carried out.

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