Development of ceramic metal oxide membranes by means of reactive electrospinning

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Abstract — **Experts agree that carbon dioxide is the leading cause of the increase in global warming. To combat global climate change, Carbon Capture and Storage technology has been developed and implemented to reduce the amount of carbon dioxide and other malignant gases in the atmosphere. In efforts to contribute to this avenue of sustainable progress, we aimed to produce ceramic metal oxide membranes via reactive electrospinning with the intention of applying these novel nanofibrous membranes to greenhouse gas capture. Magnesium oxide membranes are considered viable candidates for adsorption processes because they exhibit high surface area, low density, high porosity and resistance to high temperatures and corrosion. The electrospinning solution consisted of 4MDa polyethylene oxide, acetic acid, magnesium methoxide, methanol and dichloromethane. During electrospinning, a voltage of 5-20 kV was applied to the solution in a flow-controlled needle housed in a humidity-controlled chamber. Once critical charge density was reached at the tip of the needle the solution formed a Taylor cone which ejected a continuous jet of magnesium oxide nanofibers. Another solution being pursued is composed of 4 MDa polyacrylic acid which substitutes for the dichloromethane and polyethylene oxide. Experimental data was collected for varying flow rates, supplied voltage, solution composition, substrate concentration and chamber humidity. Infrared spectroscopy followed for analysis of product chemical composition. Fiber diameter and porosity will be measured through Scanning Electron Microscopy (SEM). Ideally, the nanofibers will exhibit a ceramic quality denoted by a visible, consistent rigidity under SEM analysis**