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Synthesis, structure and properties of highly elastic poly(dimethylsiloxane)/graphene oxide composite elastomer membranes HEONJOO HA, University of Minnesota - Twin Cities, JAESUNG PARK, BENNY D. FREEMAN, The University of Texas at Austin, CHRISTOPHER J. ELLISON, University of Minnesota - Twin Cities — This study illustrates that amine functional groups on the ends of telechelic poly(dimethylsiloxane) (PDMS) can undergo post-processing reactions with surface epoxy groups on graphene oxide (GO) to form a robust elastomer during simple heating. In these materials, GO acts as a nanofiller that reinforces the mechanical properties and participates as a multifunctional crosslinker that promotes elastic properties. Experiments indicate that the telechelic PDMS/GO elastomer is highly crosslinked (e.g., more than 75 wt % is a non-dissolving crosslinked gel) but highly flexible such that it can be stretched up to 300% of its original length. After processing these materials into membranes, the permeability for some common gases was studied as a function of GO concentration. Due to the macromolecular network and tortuous pathways formed during the curing reaction, factor of two enhancements in gas selectivities were observed for CO2/N2 and CO2/CH4 compared to neat PDMS membranes. Considering the expected thermal and chemical tolerance of the PDMS/GO composite membrane detailed in this work suggests these membranes could be useful in applications such as post-combustion CO2 capture, CO2 removal from natural gas and in other industries that use or process CO2.

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