CLAIMS

1. A dehydration membrane comprising:

a porous support; and

a composite coated on the porous support comprising a crosslinked graphene oxide compound,

wherein the crosslinked graphene oxide compound is formed by reacting a mixture comprising a graphene oxide compound and a crosslinker comprising a polycarboxylic acid;

wherein the graphene oxide compound is suspended within the crosslinker and the weight ratio of the graphene oxide compound to the crosslinker is at least 0.01.

2. The dehydration membrane of claim 1, wherein the porous support is a non-woven fabric comprising polypropylene, polyamide, polyimide, polyvinylidene fluoride, polyethylene, polyethylene terephthalate, polysulfone, polyether sulfone, or a combination thereof.

3. The dehydration membrane of claim 1 or 2, wherein the graphene oxide compound comprises a graphene oxide, reduced-graphene oxide, functionalized graphene oxide, functionalized and reduced-graphene oxide, or a combination thereof.

4. The dehydration membrane of claim 3, wherein the graphene oxide compound comprises graphene oxide.

5. The dehydration membrane of claim 1, 2, 3, or 4, wherein the polycarboxylic acid comprises poly(acrylic acid).

6. The dehydration membrane of claim 1, 2, 3, 4, or 5, wherein the composite or mixture further comprises an additional crosslinker of polyvinyl alcohol, a borate salt, or a combination thereof.

7. The dehydration membrane of claim 6, wherein the polyvinyl alcohol is about 0 wt% to about 50 wt% of the composite.

8. The dehydration membrane of claim 6 or 7, wherein the borate salt is about 0 wt% to about 20 wt% of the composite.

9. The dehydration membrane of claim 6, 7, or 8, wherein the borate salt comprises potassium borate.

10. The dehydration membrane of claim 1, 2, 3, 4, 5, 6, 7, 8, or 9, wherein the composite or mixture further comprises a surfactant.

11. The dehydration membrane of claim 10, wherein the surfactant is sodium lauryl sulfate.

12. The dehydration membrane of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11, wherein the composite or mixture further comprises a binder, wherein the binder comprises a lignin, and wherein the lignin comprises sodium lignosulfonate, calcium lignosulfonate, magnesium lignosulfonate, potassium lignosulfonate, or a combination thereof.

13. The dehydration membrane of claim 6, wherein the weight ratio of the additional crosslinker to the polycarboxylic acid is about 0 to about 1.

14. The dehydration membrane of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, or 13, wherein the weight ratio of the crosslinker to the graphene oxide compound is about 0.5 to about 100.

15. The dehydration membrane of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12, 13, or 14, wherein the composite or mixture further comprises an additive mixture comprising $CaCl_2$, LiCl, sodium polystyrene sulfonate, or a combination thereof.

16. The dehydration membrane of claim 15, wherein the $CaCl_2$ is about 0 wt% to about 35 wt% of the composite.

17. The dehydration membrane of claim 15, wherein the LiCl is about 0 wt% to about 10 wt% of the composite.

18. The dehydration membrane of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, or 17, wherein the composite is in a layer having a thickness of about 100 nm to about 4000 nm.

19. The dehydration membrane of claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, or 18, having higher permeability for water vapor than a gas.

20. A method for dehydrating a gas comprising:

applying a first gas component comprising water vapor to the dehydration membrane of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, or 19; and

allowing the water vapor to pass through the dehydration membrane and to be removed; and generating a second gas component that has lower water vapor content than the first gas component.