Poly (ethylene furanoate) (PEF)/Graphene Nanocomposites: A New Paradigm of Sustainability in Materials and Membranes

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With the developing strict environmental laws towards synthetic polymers, the world is observing a game-changing plethora of bio-based polymers to replace the existing synthetic plastics. However, a technological reiteration of applicability of new bio-based polymers is extremely important and should be benchmarked against the synthetic counterparts. Poly (ethylene furnanoate) (PEF) is one of the most highlighted bio-based polymers which is presumed to replace poly (ethylene terephthalate) (PET) – an industrial giant of this era. Though PEF is 100% bio-renewable and exhibited exceptional gas barrier properties, properties connecting towards its mass scale applications are either weak or not studied comprehensively. This presentation summarizes our efforts in modifying PEF by physical blending with other polymers and manufacturing its nanocomposites with graphene to understand technological difference between PET and PEF for same targets. Two key applications will be discussed: I) Bulk PEF/graphene nanocomposites for antistatic applications and localization of graphene at the polymer/polymer interface; and II) PEF/graphene nanofibrous membranes for water filtration membranes, particularly for removing microplastics in water. Overall, results are encouraging in both applications; however, there is a long road ahead towards practical implications of PEF in our daily life.

References

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[2] Juraij Kandiyil, Anuj Niroula, Yaser Greish, Prasanna Mural, Akmal Nazir, Muhammad Z. Iqbal, Journal of Membrane Science, 717 (2025) p123622.

Figures

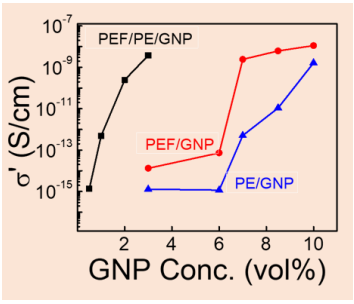

Figure 1: Engineering PEF/PE interface with graphene nanoplatelets

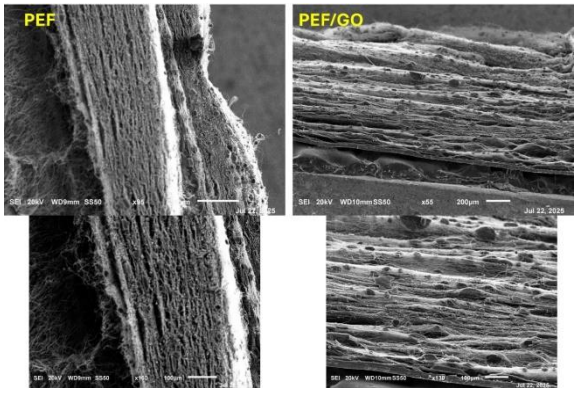

Figure 2: PEF/GO membranes for water filtration