Upcycling PET waste into Bimetallic Metal Organic Framework

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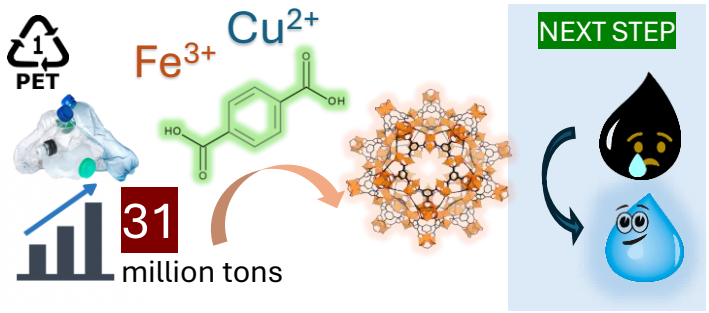
Green Chemistry & Sustainability

Introduction



Plastic pollution threatens sustainability...

In the ASEAN region alone as over **31 million tons**[1] **of plastic waste** generated annually in six of its ten countries**, with a low recycling rate of just 26%**[2] leading to accumulation and subsequent environmental degradation. Traditional PET recycling methods yield lower-grade materials, hindering circularity as an expensive processes.

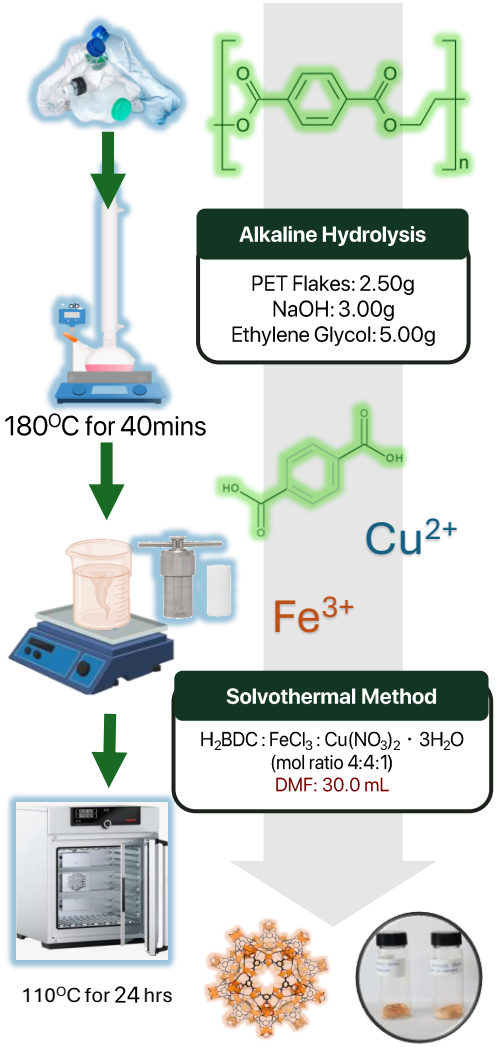
A Glimpse of Hope

Upcycling waste PET into terephthalic acid (H_2BDC) as precursors for MOF synthesis, like emerging bimetallic MOF's (Fe, Cu), offers an alternative into functional materials for environmental applications (e.g., heavy metal, antibiotic removal)[3-5] while combatting waste landfilling.

The Long Journey There...

- ❑ Produce **high-quality** MOFs from recycled PET.
- ❑ Survey potential as a sustainable material for environmental applications. (i.e. Arsenic Removal, Antibiotic Removal)

Experimental: Methods and Results



Upcycled Terephthalic Acid (H_2BDC)

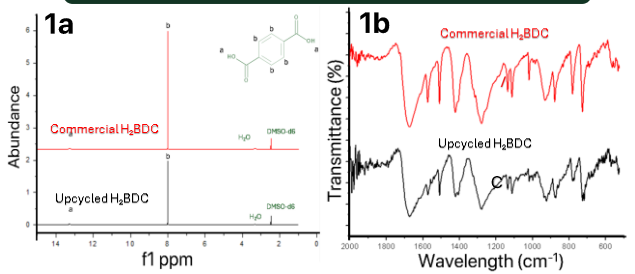
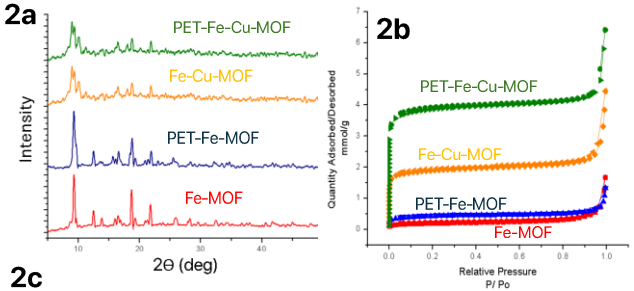


Figure 1 (a-b). Characterization of the Upcycled H_2BDC: (a) NMR Spectra (b) FTIR Spectra.

MOF Synthesis



2c

Parameter	Fe MOF	PET Fe MOF	Fe-Cu MOF	PET Fe-Cu MOF
BET Surface Area	14.73 m^2/g	30.95 m^2/g	128.47 m^2/g	263.14 m^2/g

Figure 2 (a-c). Characterization of the MOFs:
(a) XRD Diffractogram
(b) BET Isotherm
(c) BET comparison table

Conclusion

Plastic is not a **waste** at all.
but only an **untapped resource...**

Our findings show we can upcycle plastic waste as a renewable feedstock especially as precursor for fabricating bimetallic metal-organic frameworks (BMOFs). These green porous materials exhibit significant potential for water purification as we forge a circular pathway from landfill to valuable solutions.

Green Chem Principles and SDG Goal

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References