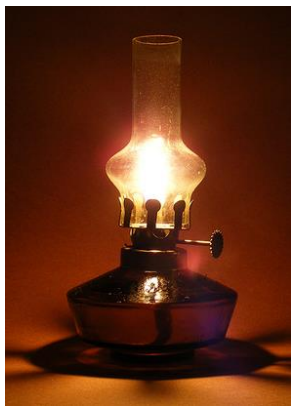


Sustainable Raw Material to Functional Organic Materials



Not Sustainable

by

Dr. P. Vairaprakash

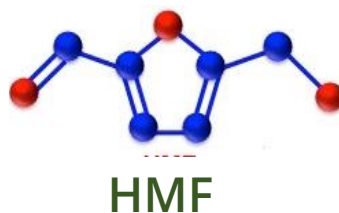
Assistant Professor, Chemistry

School of Chemical and Biotechnology



Sustainable

5% of Fossil Fuel Resources
Non-Energy Use
Fine Chemicals
Chemical feed stock



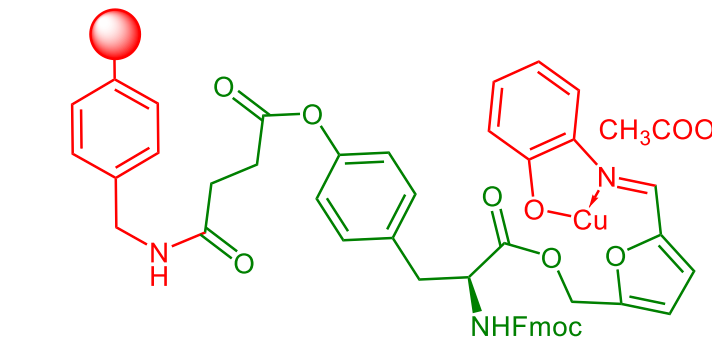
Sustainability in
Raw materials
via 5-hydroxymethylfurfural

Objective

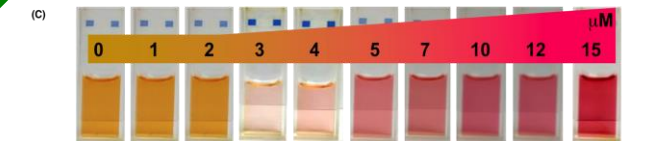
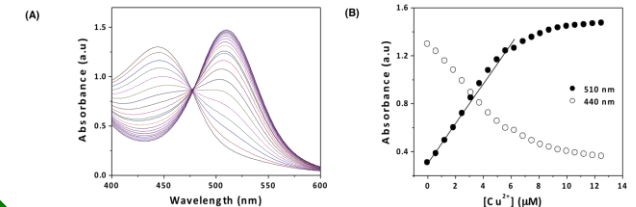
- Mitigating the Dependence on Fossils

Milestones Accomplished:

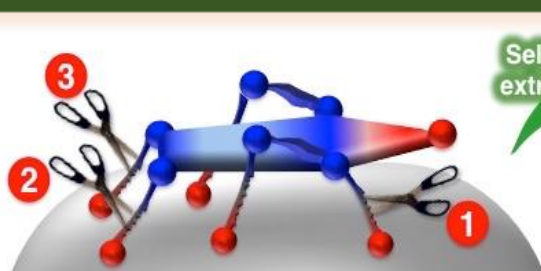
- RT Synthesis of HMF from Fructose
- Conversion of CAB into HMF
- Development of copper(II) catalyst
 - ❖ DPM & Propargylamine Synthesis
 - ❖ Naked Eye Cu(II) Chemo-sensor
- Development of immobilized BODIPYs
 - ❖ Photo-arylation using BODIPYs



HMF-derived immobilized Cu(II) catalyst

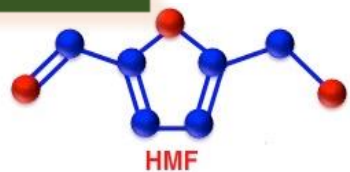


Naked-eye Cu(II) Chemosensor



Fructose (on silica)

Selective extraction



HMF

Green-colored components are sustainable raw material-derived

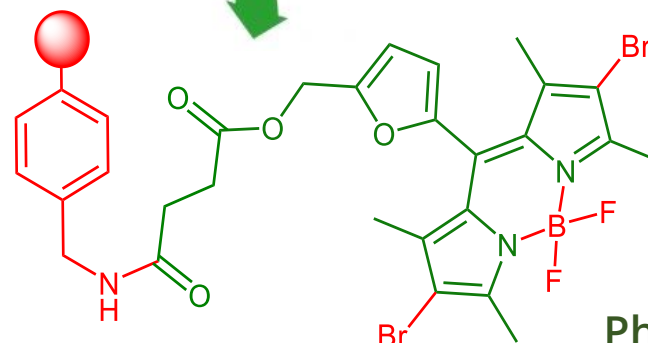
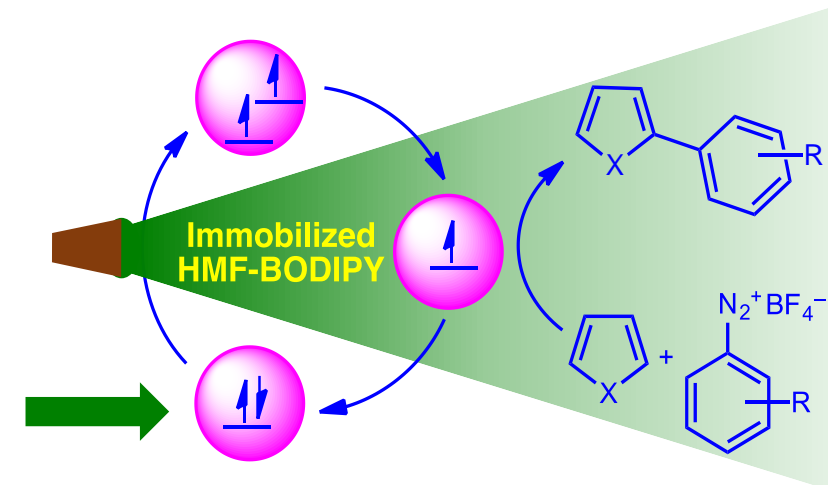


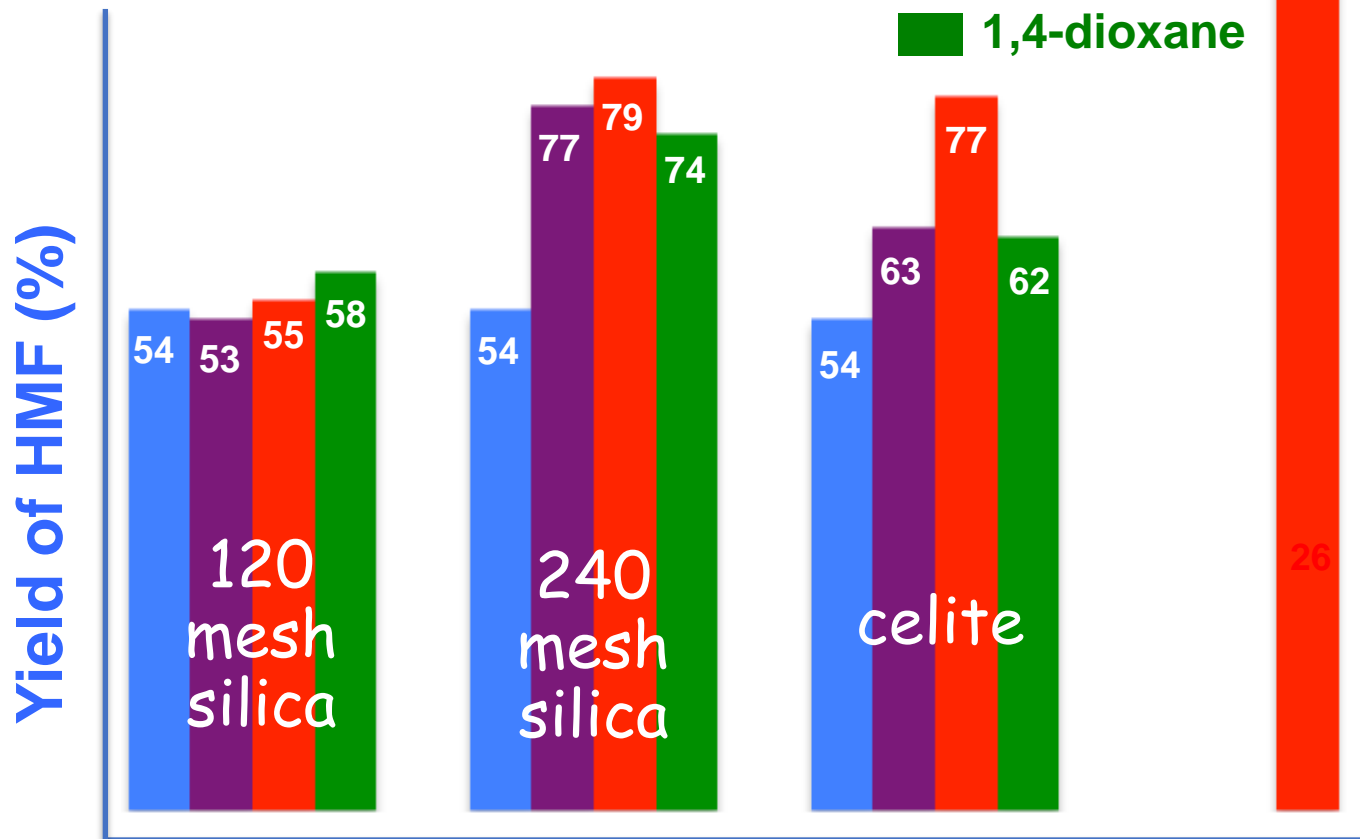
Photo-arylation using immobilized BODIPYs



Synthesis of 5-Hydroxymethylfurfural

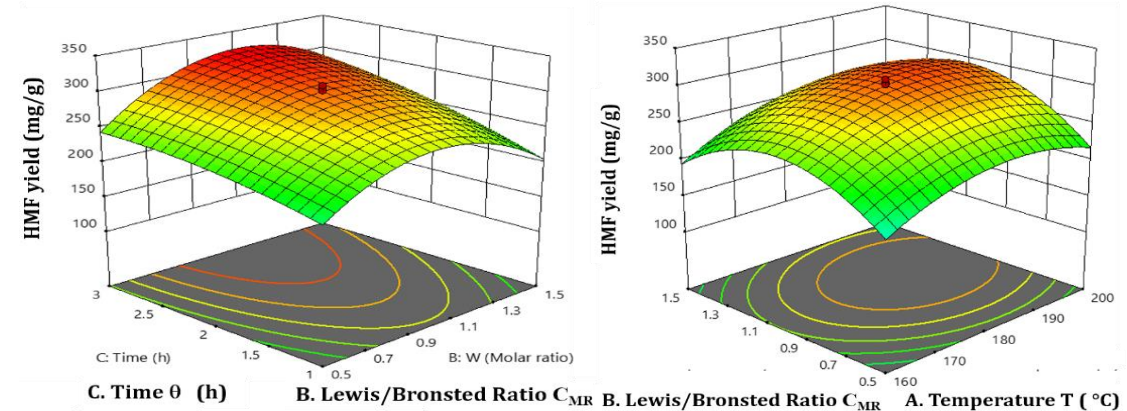
Room Temperature Synthesis of HMF from Fructose

- EtOAc
- Acetonitrile
- THF
- 1,4-dioxane



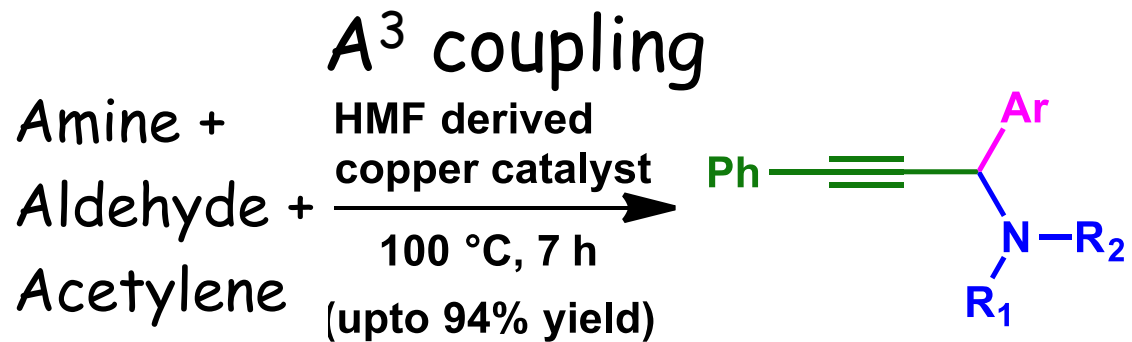
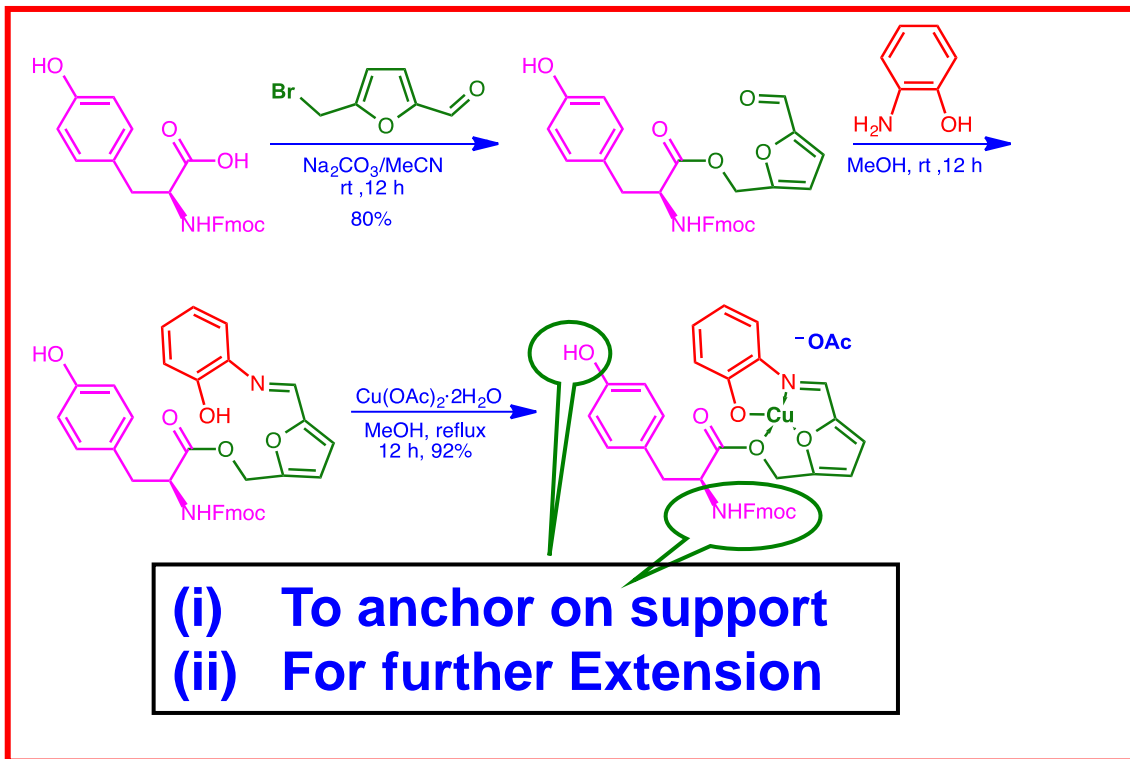
RSC Adv., 2015, 5, 100401

Synthesis of HMF from Cashew Apple Bagasse

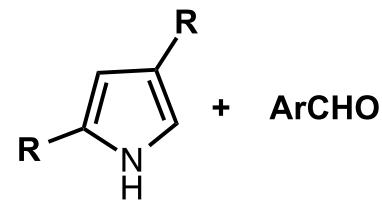


Industrial Crops & Products
 159 (2021) 113081

HMF- Derived Cu(II) catalyst

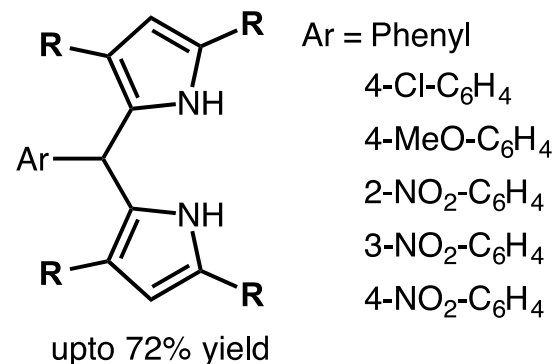


DPM synthesis

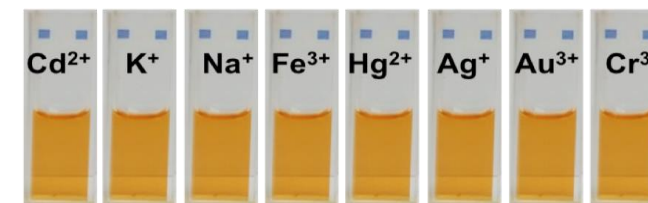
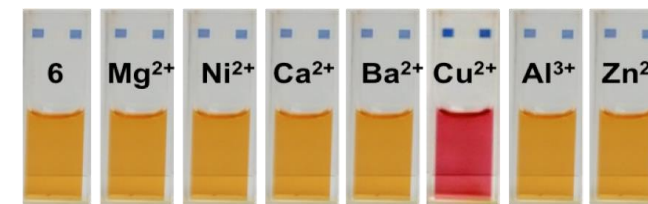
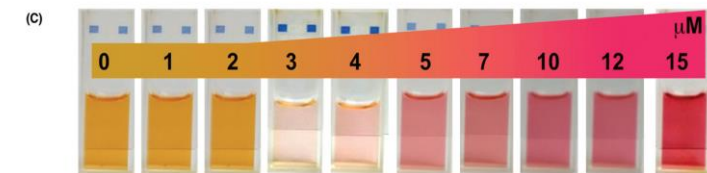
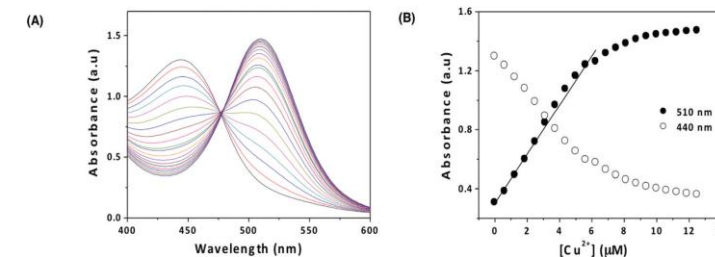


$\text{R} = \text{Me or H}$

Immobilized Copper catalyst

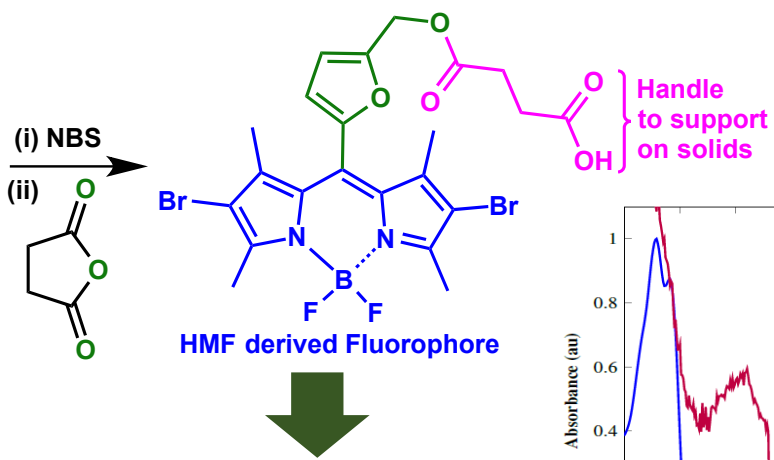
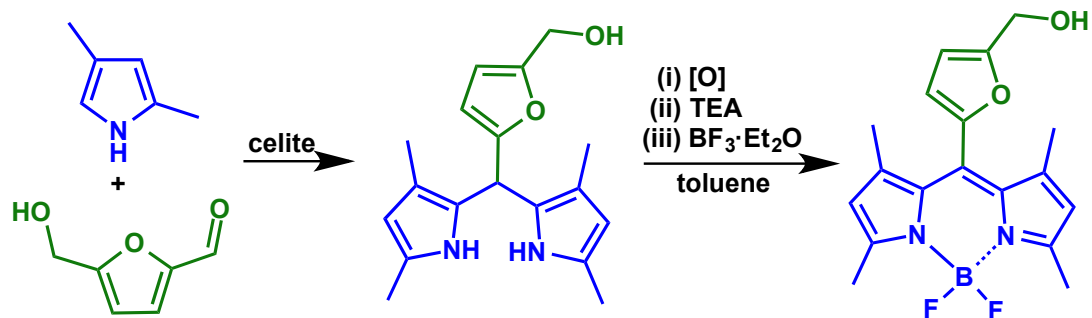


DPM-derived Chemo-Sensor

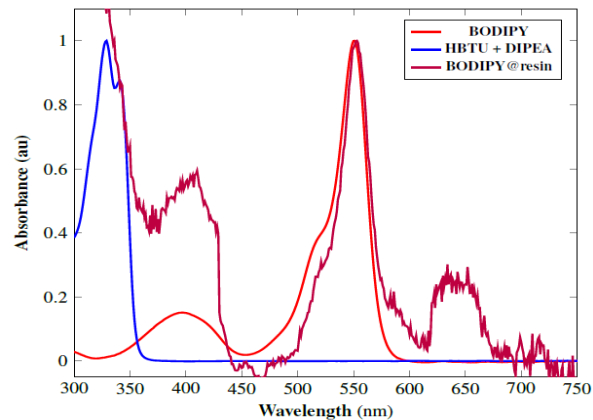


Analyst, 2017, **142**, 3346

HMF-Derived photocatalyst

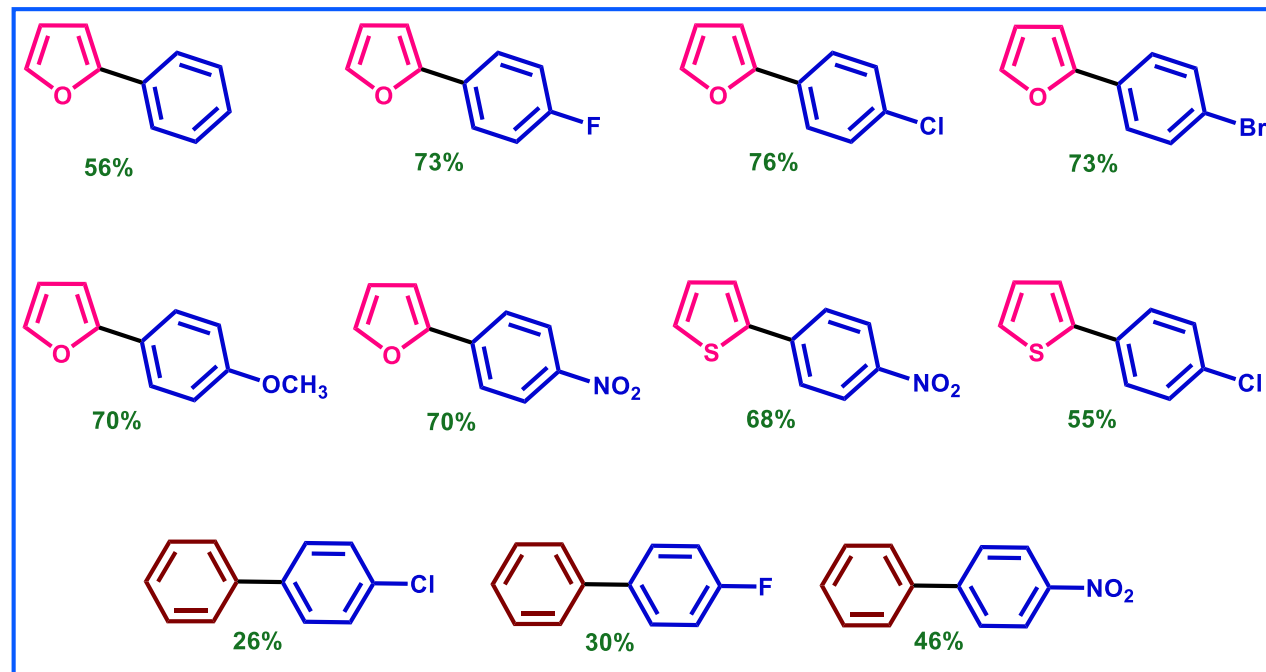
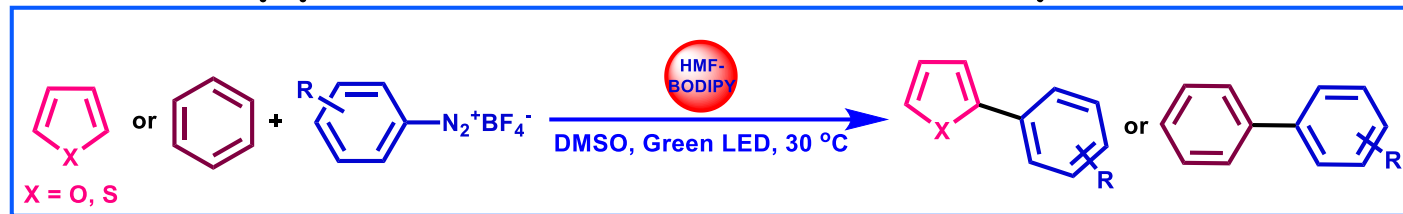


Immobilization
on
Polymeric resin



Immobilized &
free catalyst

Applications in Photo-arylation



ACS Omega 2019, 4, 14458–14465

Conclusions

- In the context of Waste Management
 - CAB, an agricultural waste is converted into HMF
- In the context of sustainability
 - room temperature synthesis of HMF from fructose was developed using solid phase approach
- Demonstrated applications of HMF
 - Development of Immobilized Copper(II) catalyst
 - Chemo-sensor for copper(II) ions
 - Development of BODIPY based photocatalyst

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 - Dr. A. Arumugam, SASTRA
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