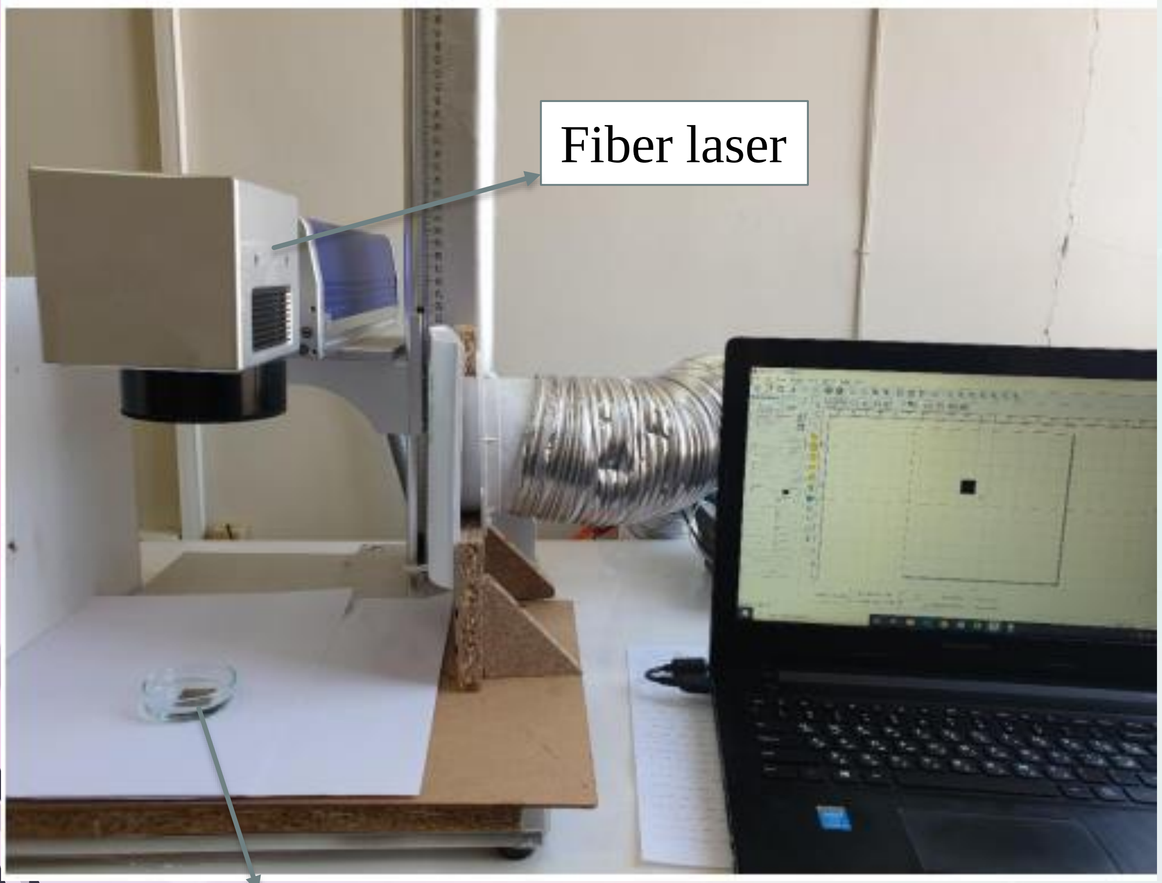
Laser parameters

LAL setup



λ= 1064 nm
Power: 30 W
Pulse repetition rate: 20 KHz
Duration: 100 ns
Pulse energy: 1.5 mJ
laser pulse fluence: 59.68 J/cm^2
Spot size: 40 µm

Area: 7*7 mm^2
Speed: 200 mm/s

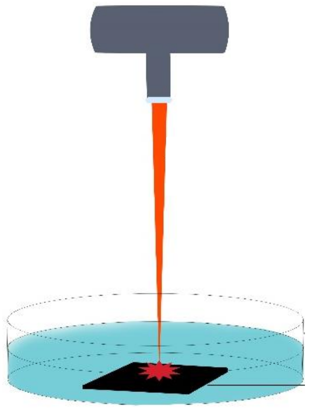
Deposition of Palladium Nanoparticles on Polyethylene

Applications assessment

Deposition of Pd NPs on KBM

3

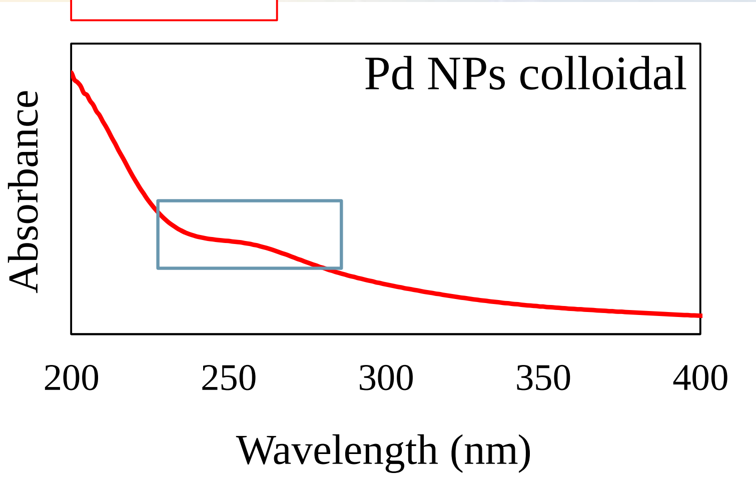
LAL setup

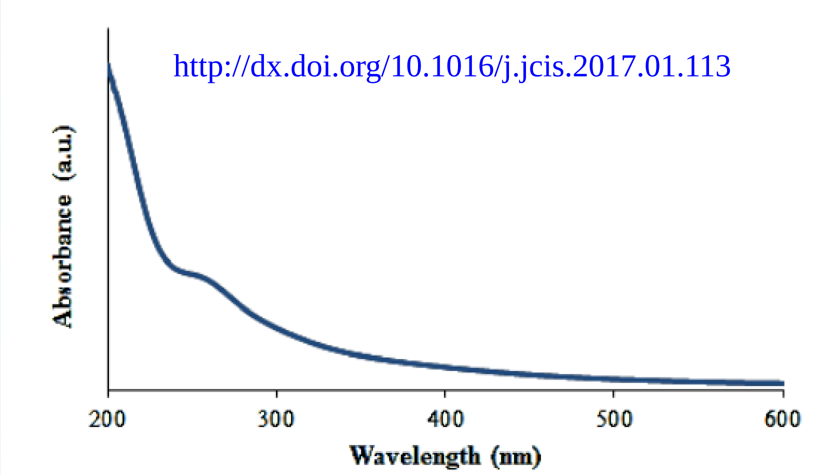


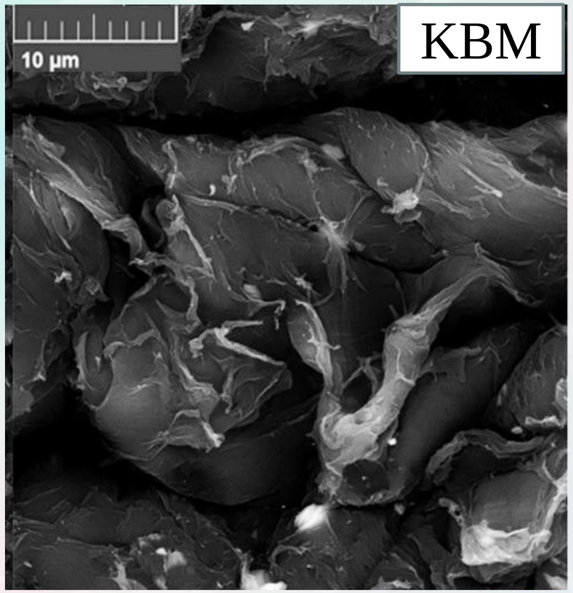
Colloidal: 0.16 mg/mL

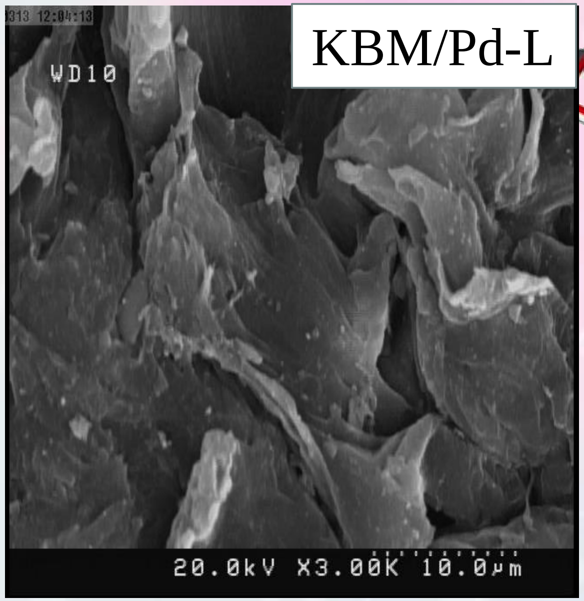
KBM/Pd-L

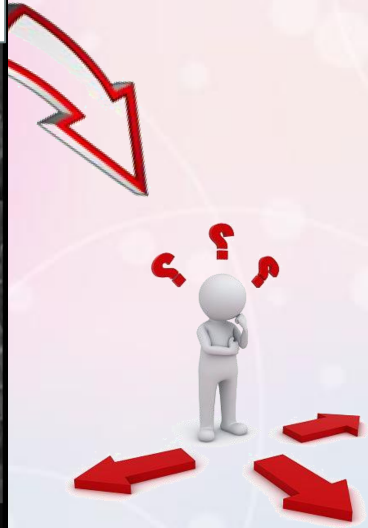
UV-vis.











Applications assessment

Deposition of Pd NPs on KBM

4

$PdCl_2$ (3 mg)

+

Doubly distilled water

↓

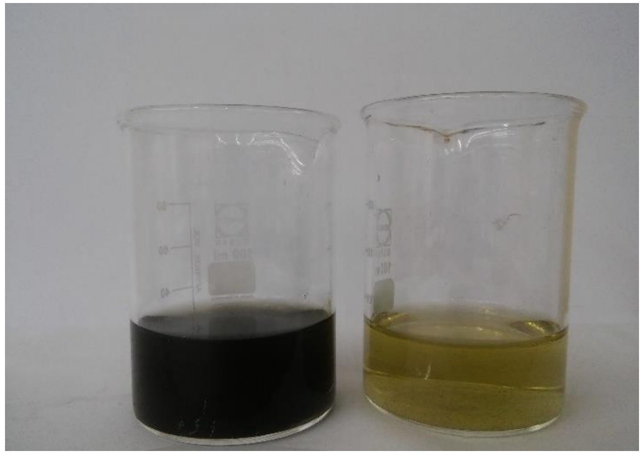
Pd NPs colloidal (7×10^{-3} M)

↓

KBM/Pd-Ch

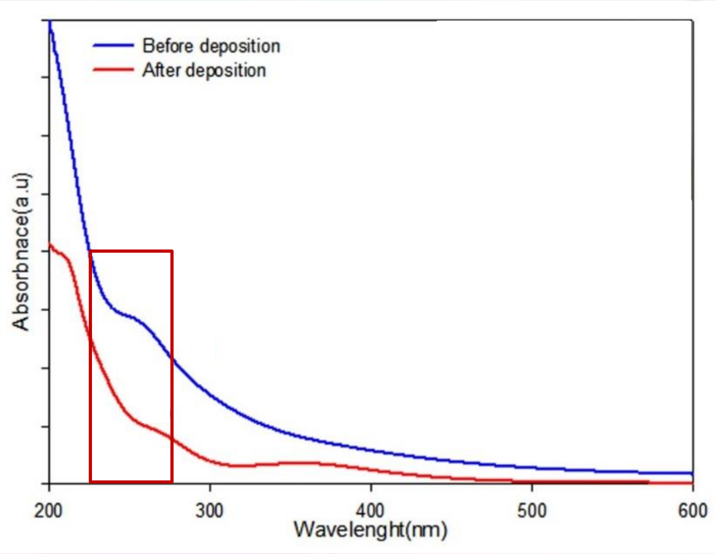
1

Color changing of Pd NPs colloidal

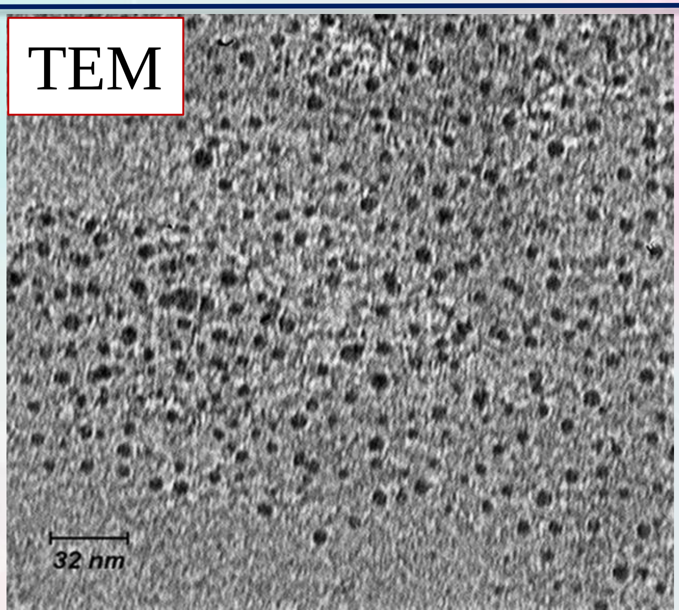


Before After

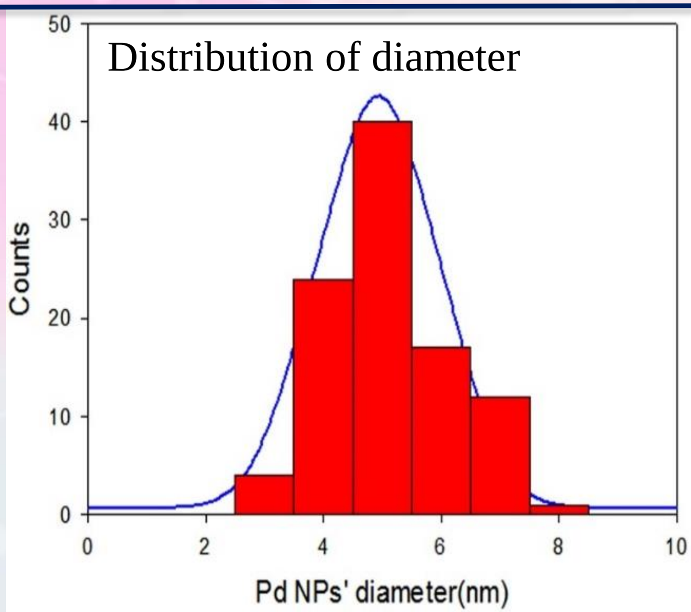
UV-Vis.



TEM



Distribution of diameter

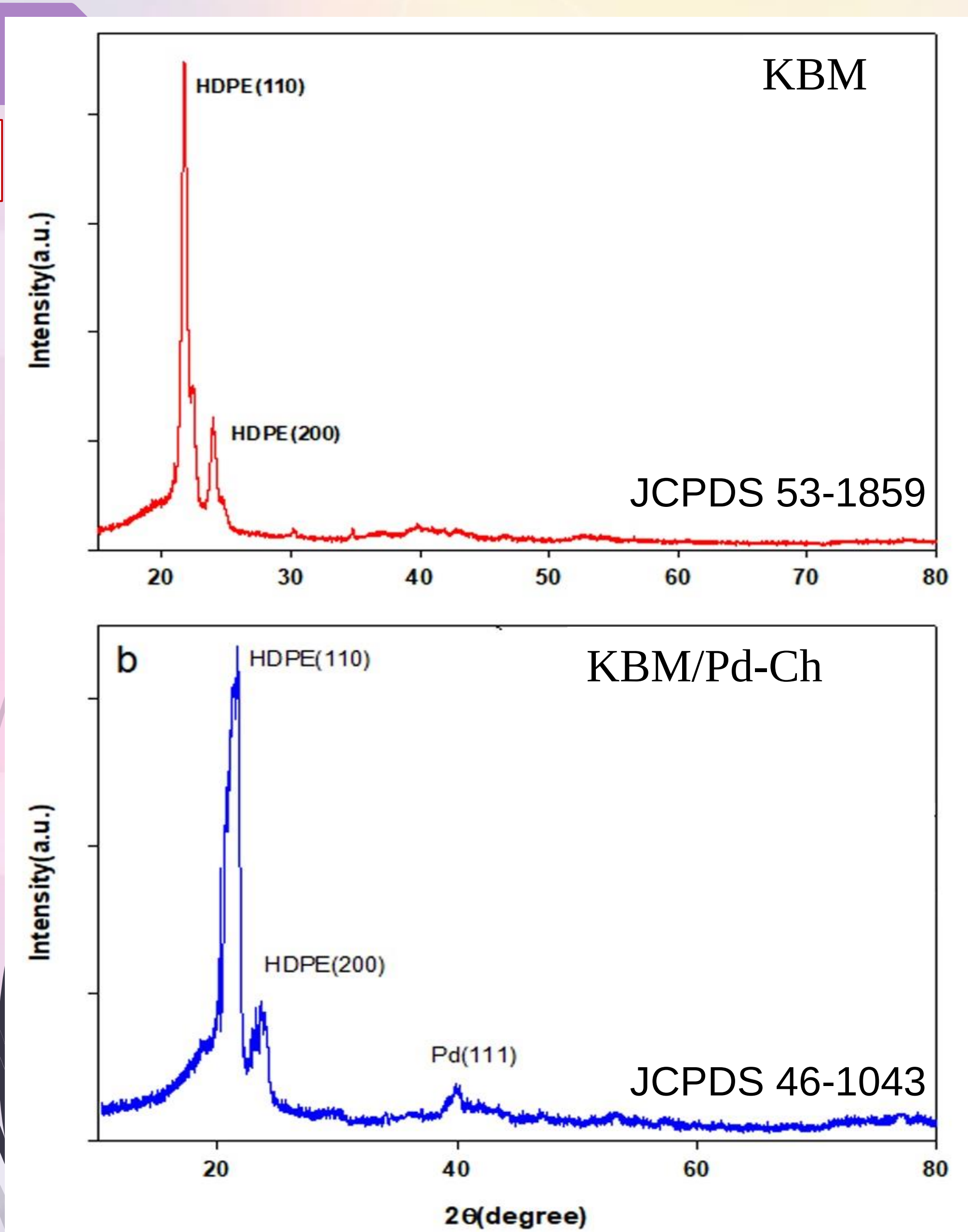


Applications assessment

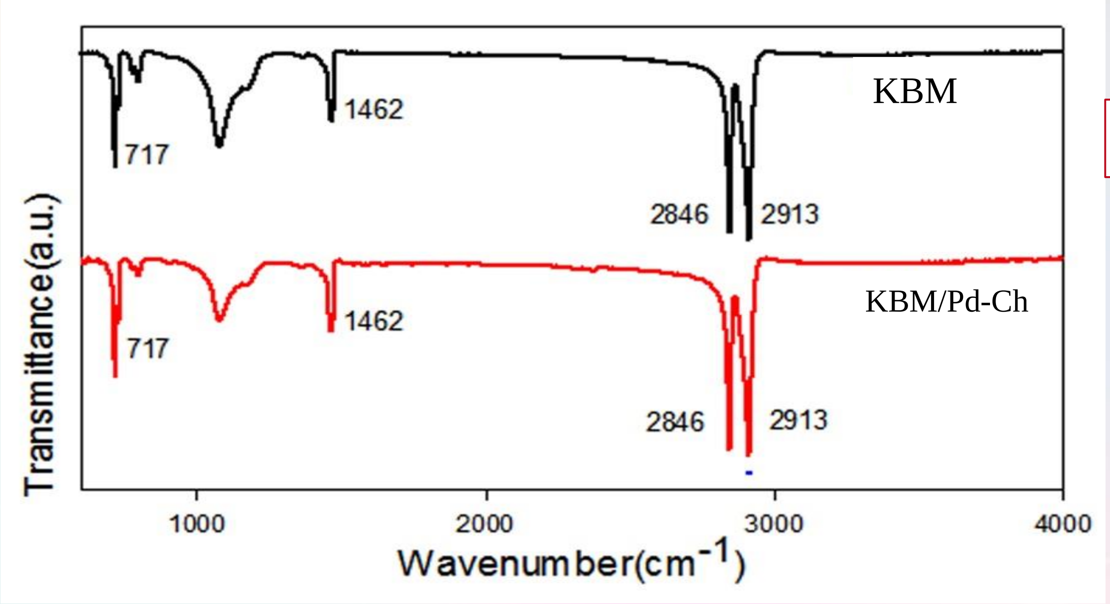
Characterization

1

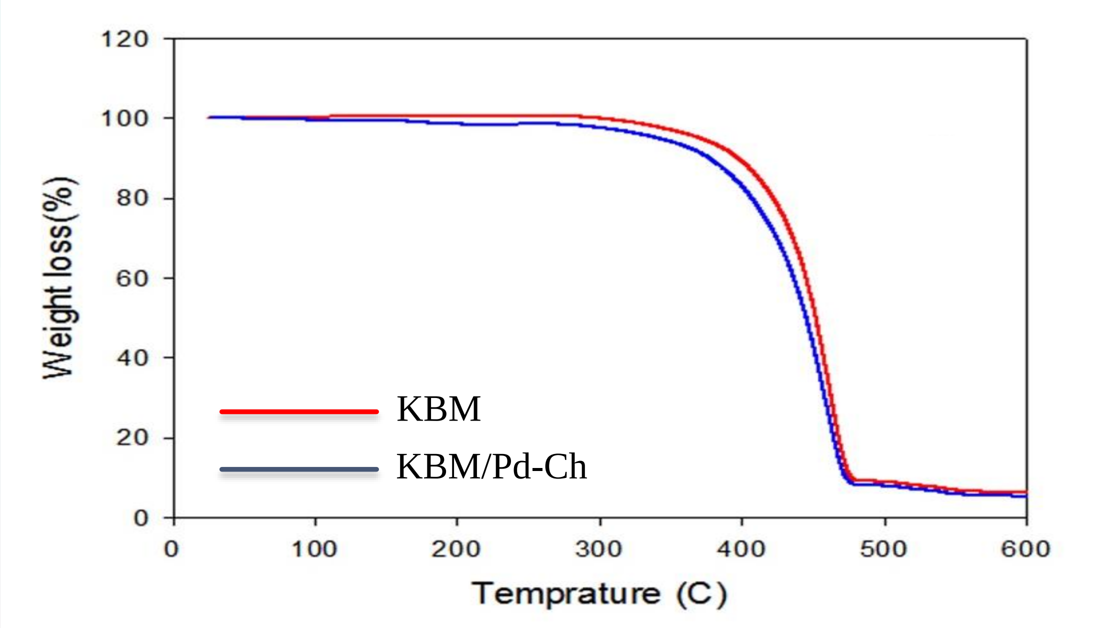
XRD



ATR



TGA

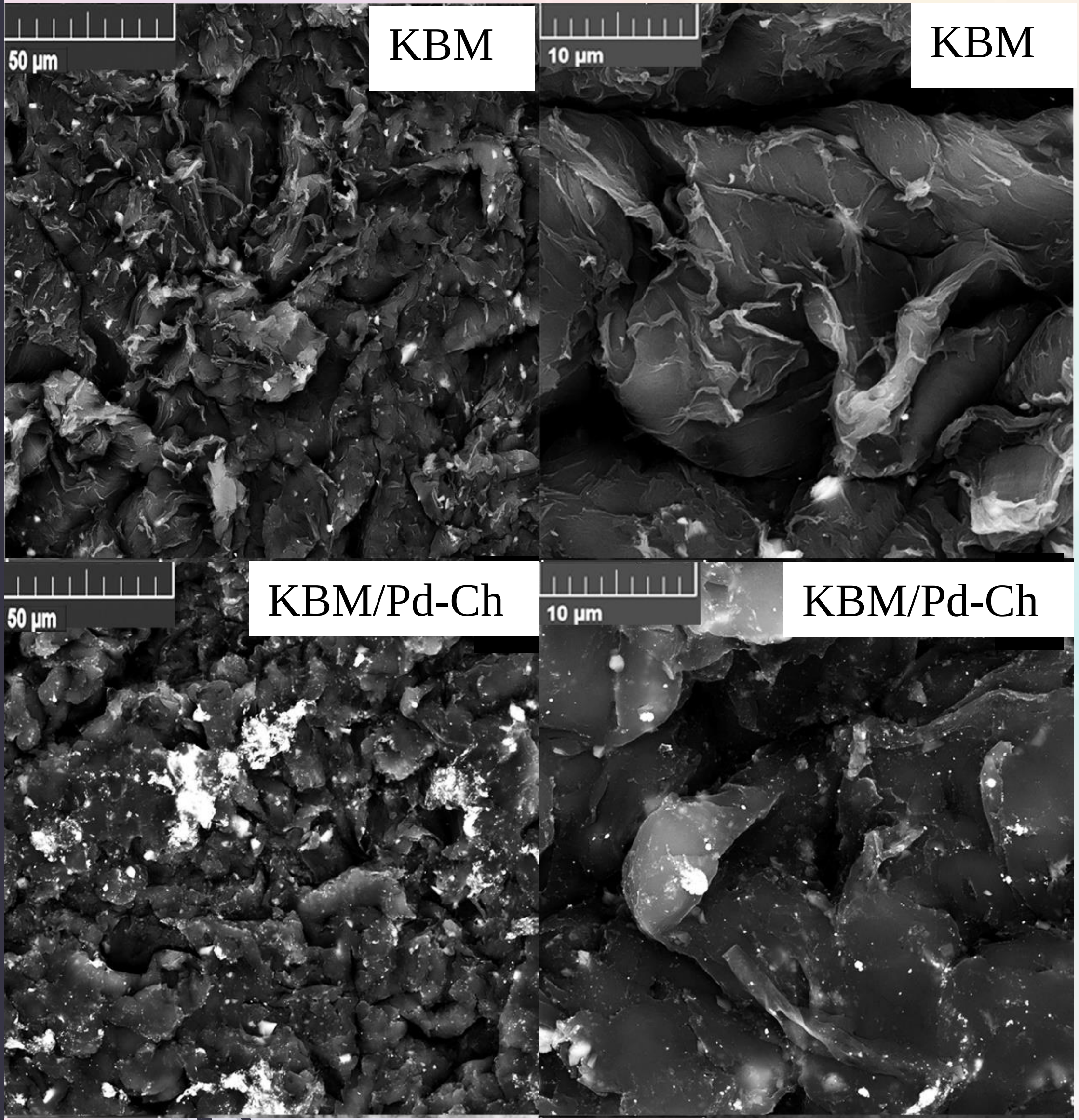


Applications assessment

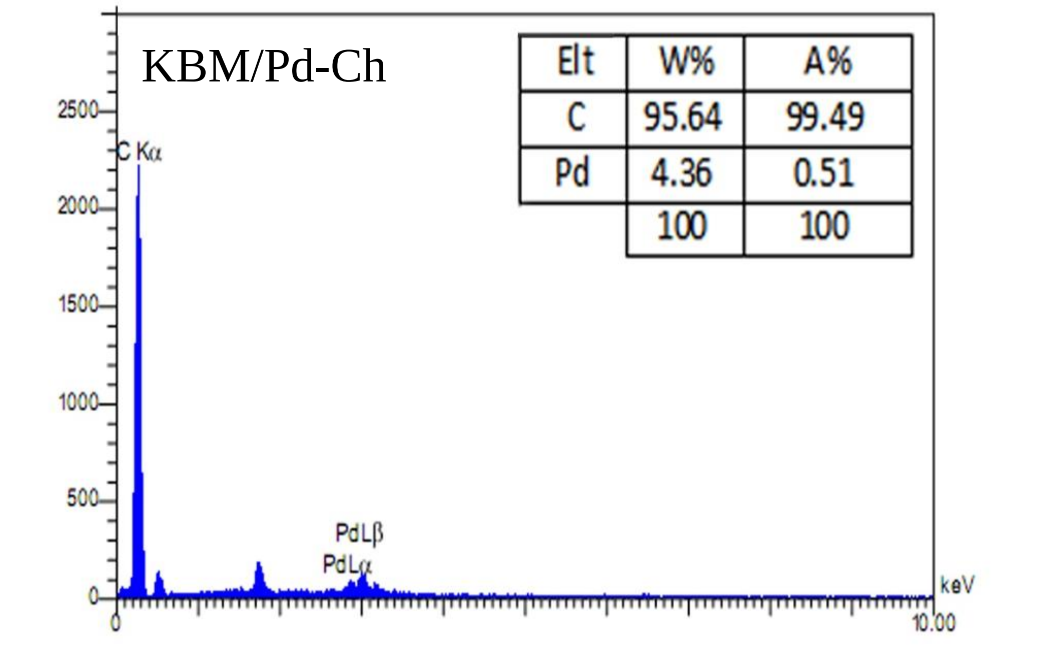
Characterization

1

SEM

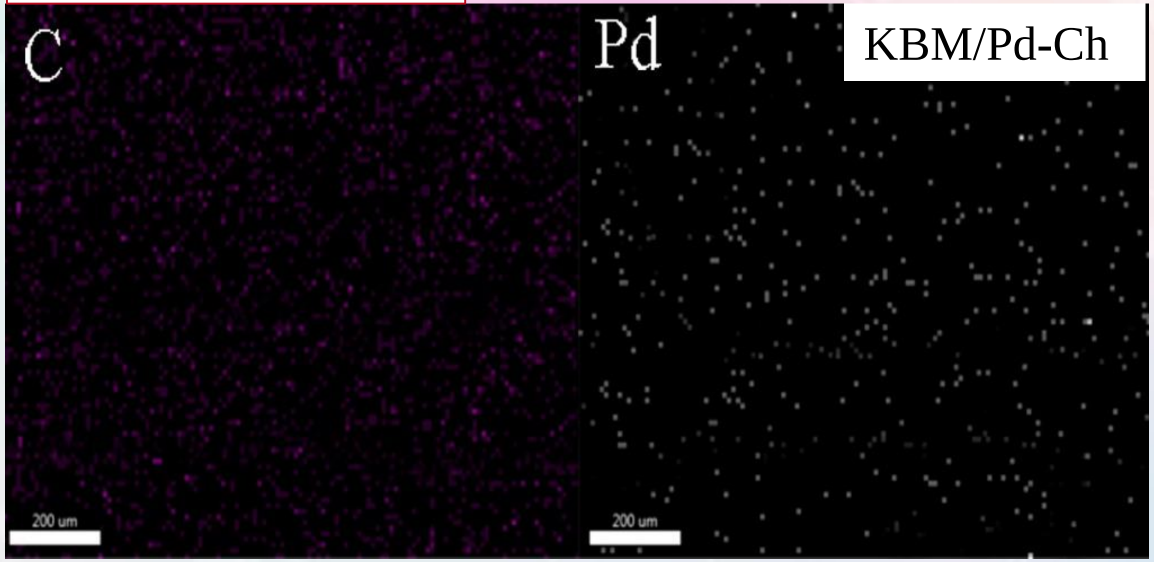


EDS

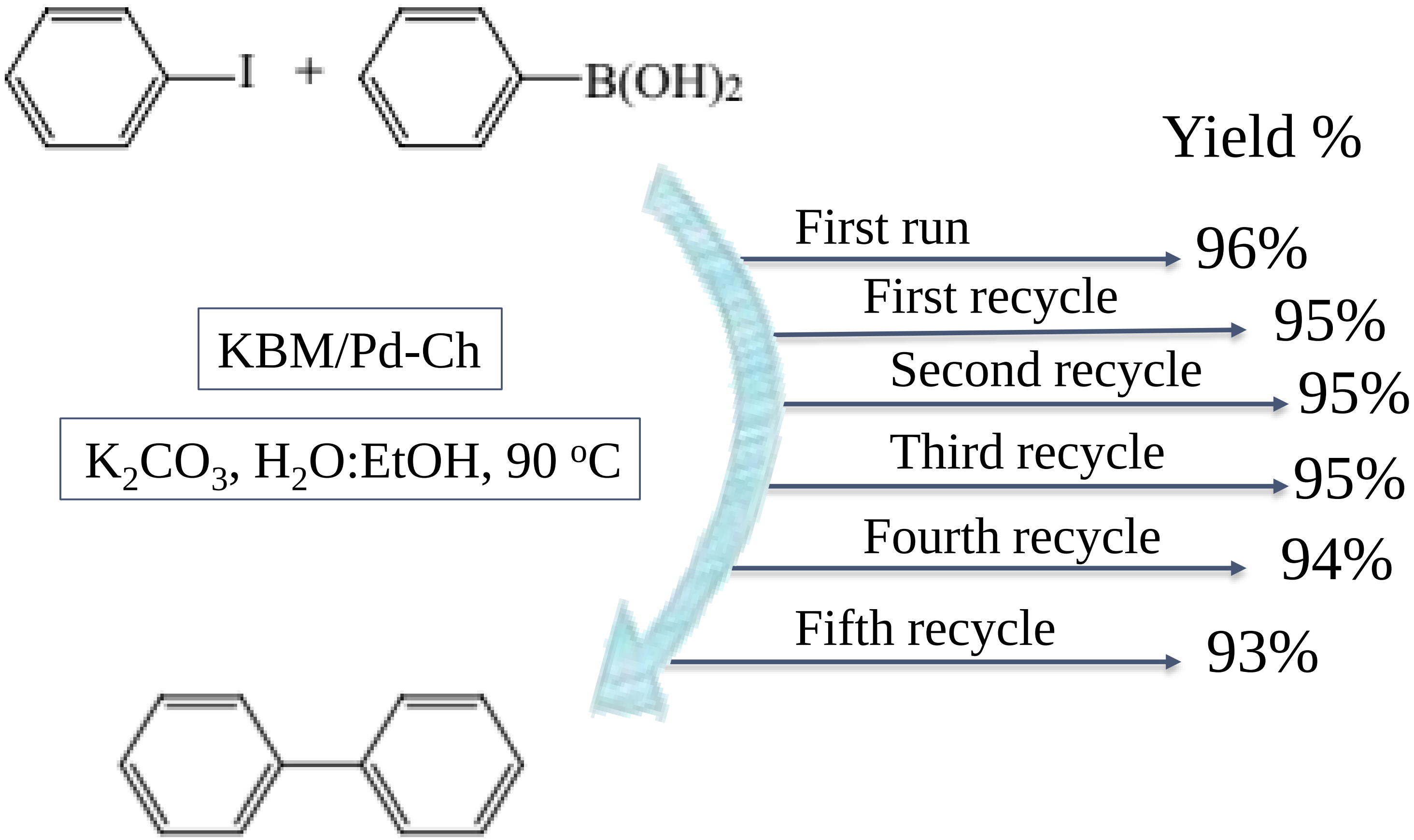


Elt	W%	A%
C	95.64	99.49
Pd	4.36	0.51
	100	100

Elemental mapping



Reusability of the KBM/Pd-Ch nanocatalyst



Conclusion

Bu-Ali Sina University

1. LAL and chemical methods managed to produce Pd NPs.
2. Pd NPs produced by chemical method were uniformly deposited on KBM.
3. Different analysis affirmed the presence of Pd NPs on the surface of KBM.
4. The nanocatalyst possesses high efficiency (96%) in Suzuki- coupling reaction.
5. The stability of nanocatalyst was successfully investigated.
6. The solid nanocatalyst shows a promise to eliminate separation facilities.

Publication

Bu-Ali Sina University

Catalysis Letters (2019) 149:169–179
https://doi.org/10.1007/s10562-018-2583-1

IF (2019): 2.48

CrossMark

Journey on Greener Pathways via Synthesis of Pd/KB Polymeric Nanocomposite as a Recoverable Catalyst for the Ligand-Free Oxidative Hydroxylation of Phenylboronic Acid and Suzuki–Miyaura Coupling Reaction in Green Solvents

Bahareh Feizi Mohazzab[1] · Babak Jaleh[1] · Mahmoud Nasrollahzadeh[2] · Zahra Issaabadi[2]

Received: 8 July 2018 / Accepted: 29 September 2018 / Published online: 12 October 2018

Bu-Ali Sina University

Deposition of Palladium Nanoparticles on Graphene oxide thin film

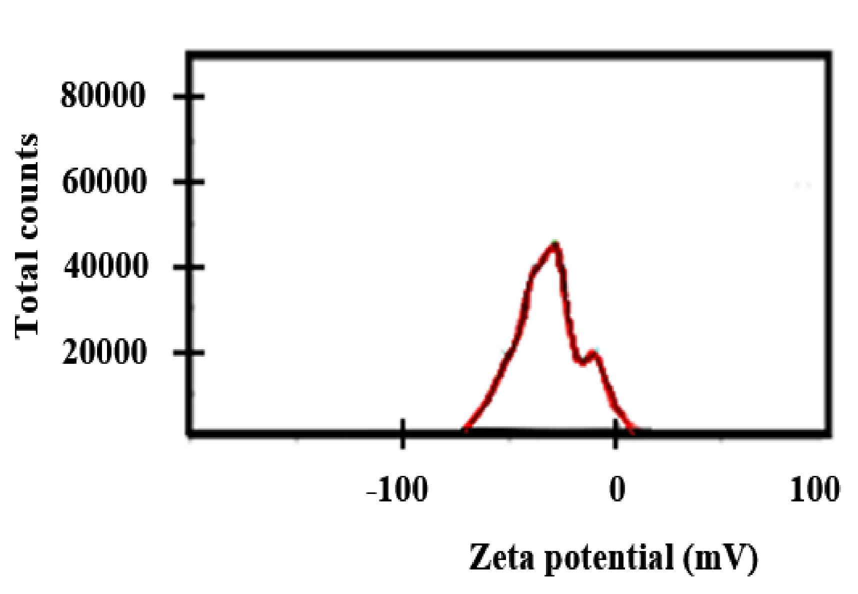
2

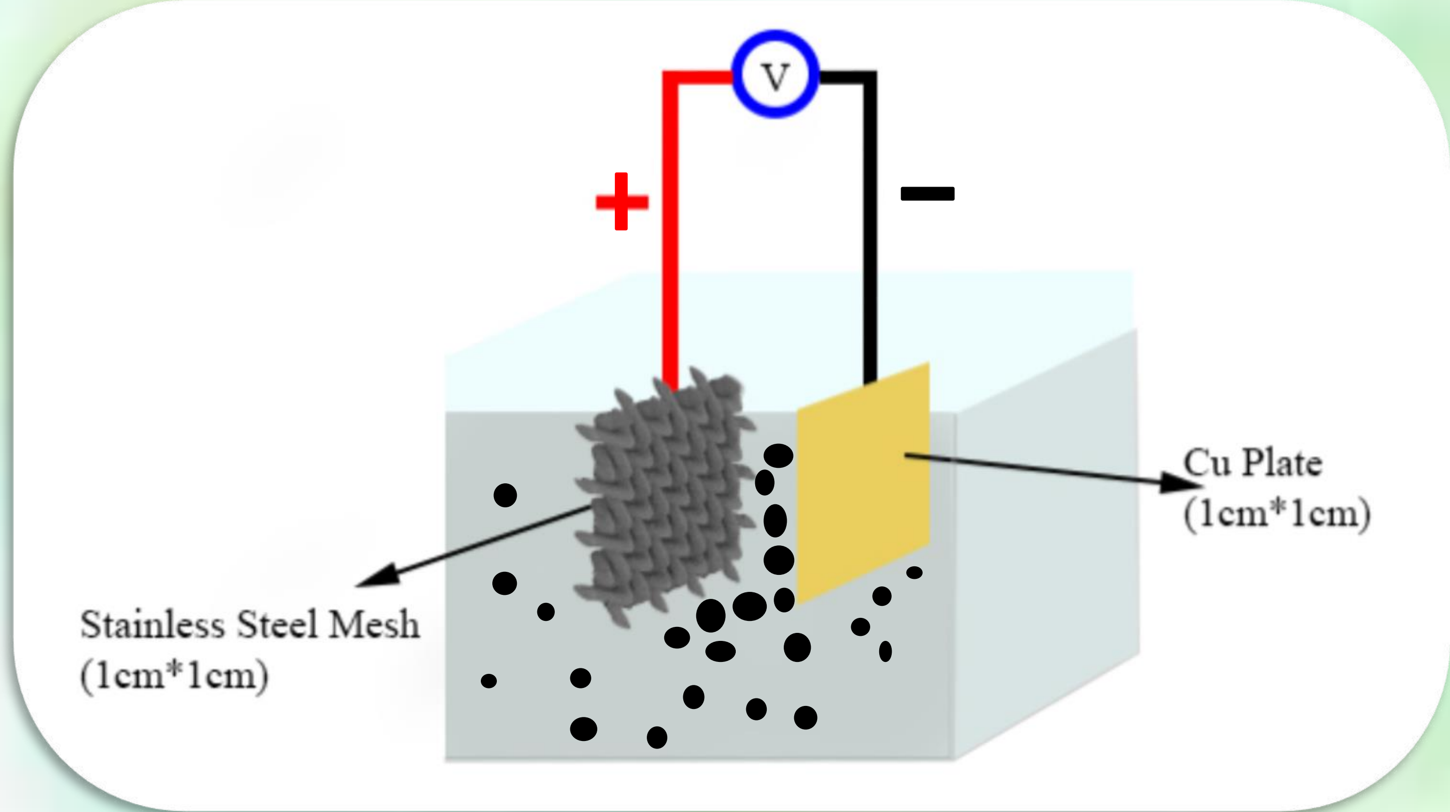
Preparation of GO thin film

Graphite → (Oxidation / Hummers' method) → Graphene oxide

Electrophoretic Deposition

Zeta potential analysis

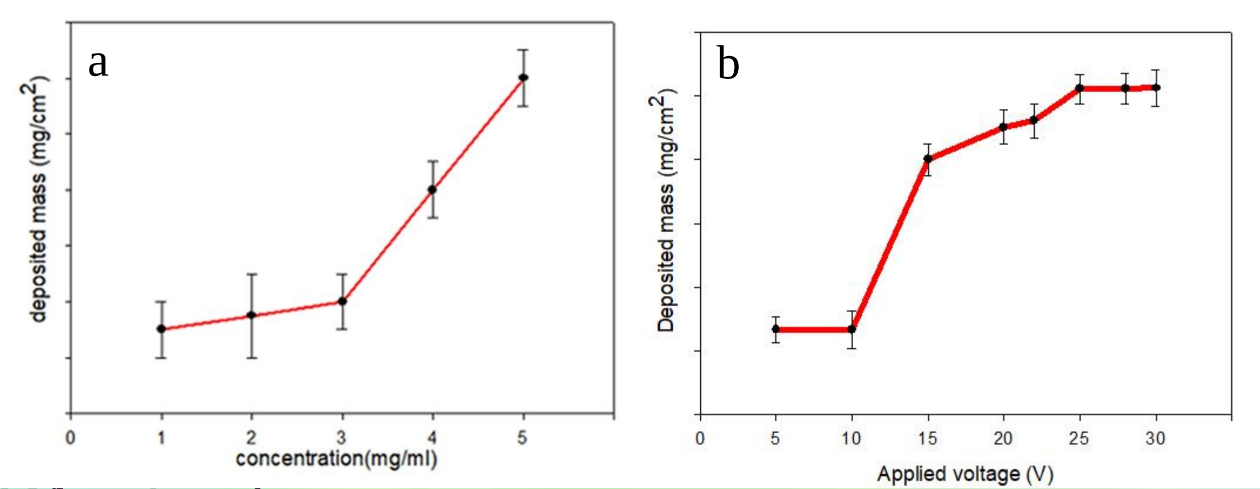


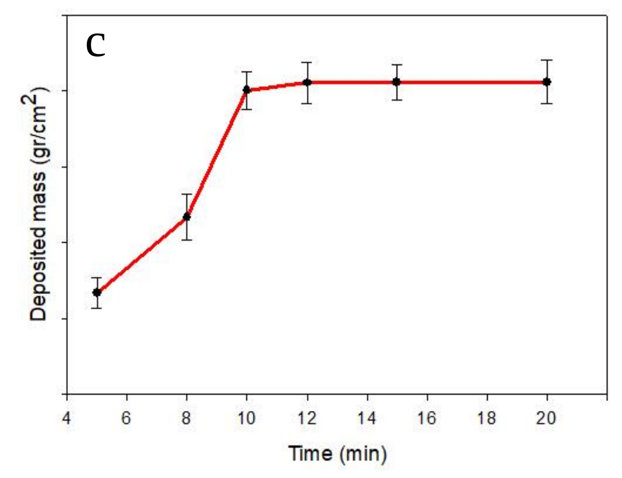


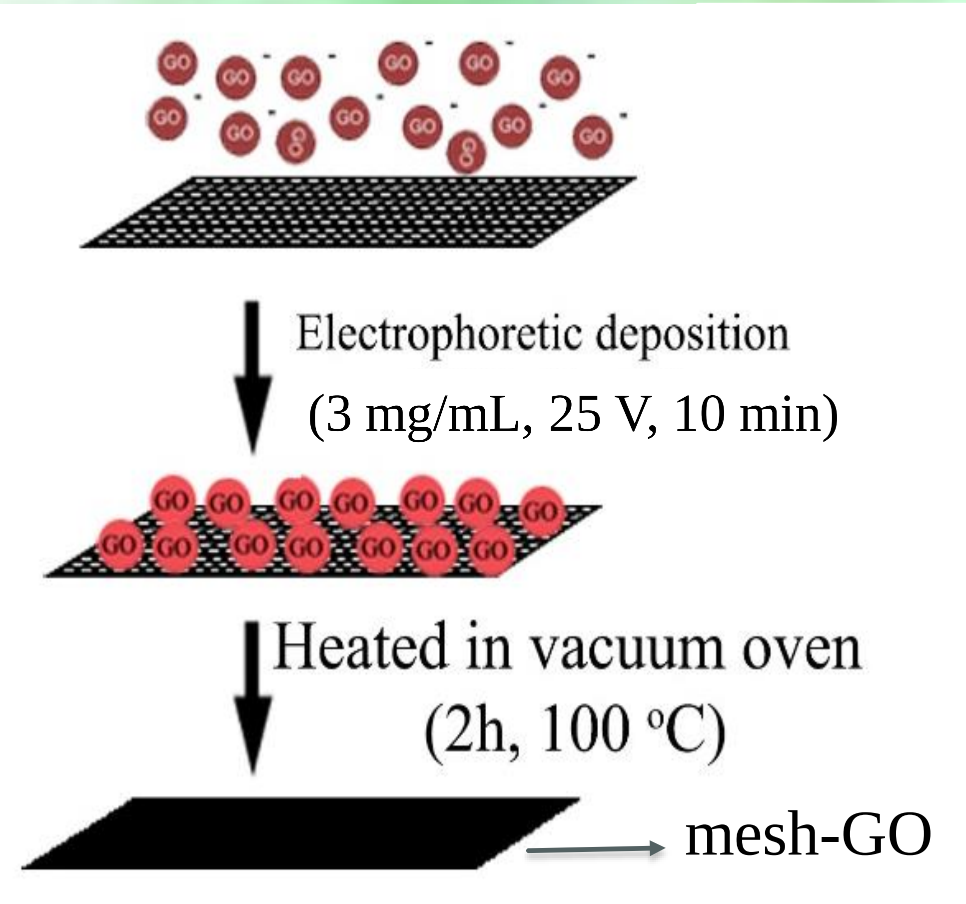
Applications assessment

Preparation of GO thin film

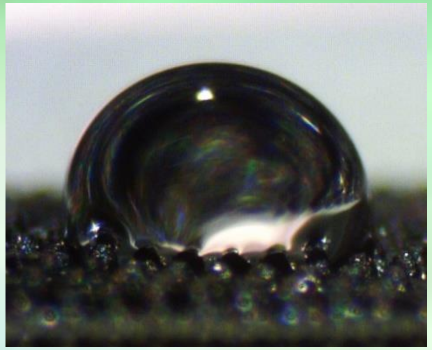
Optimization parameters for EPD







Water Contact Angles



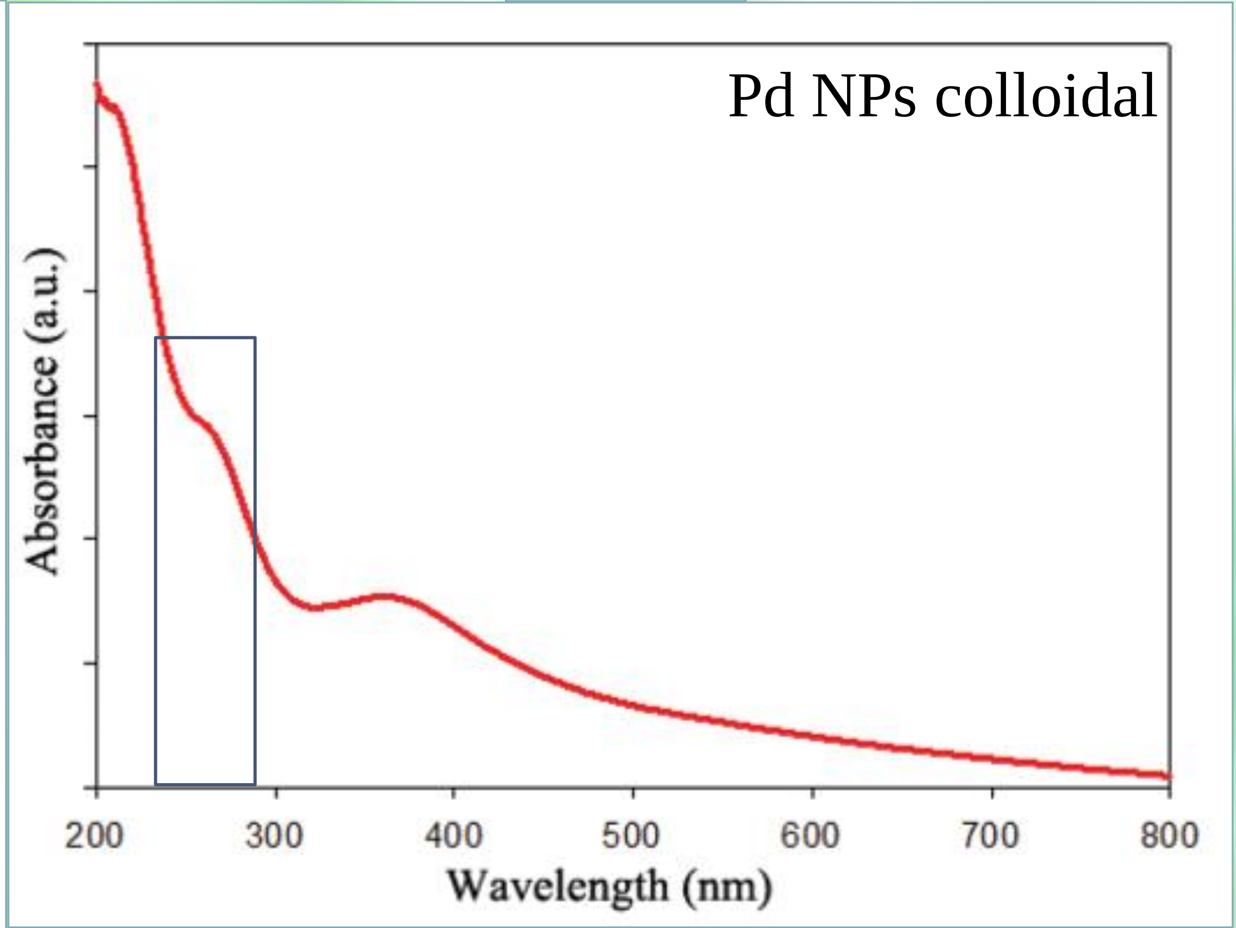
Applications assessment

Deposition of Pd NPs on thin film of GO

2

LAL process

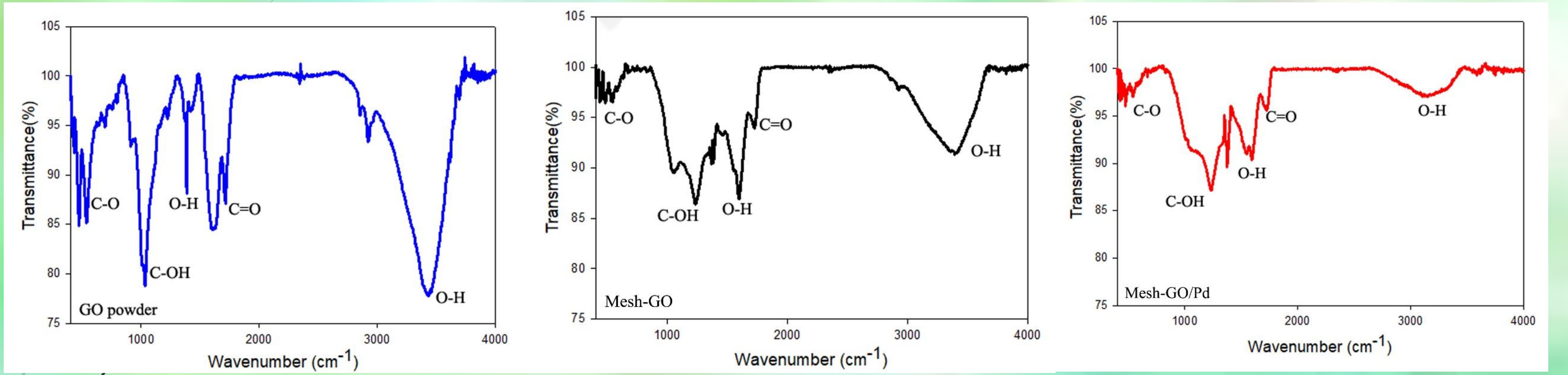
UV-vis.



Characterization

2

FTIR

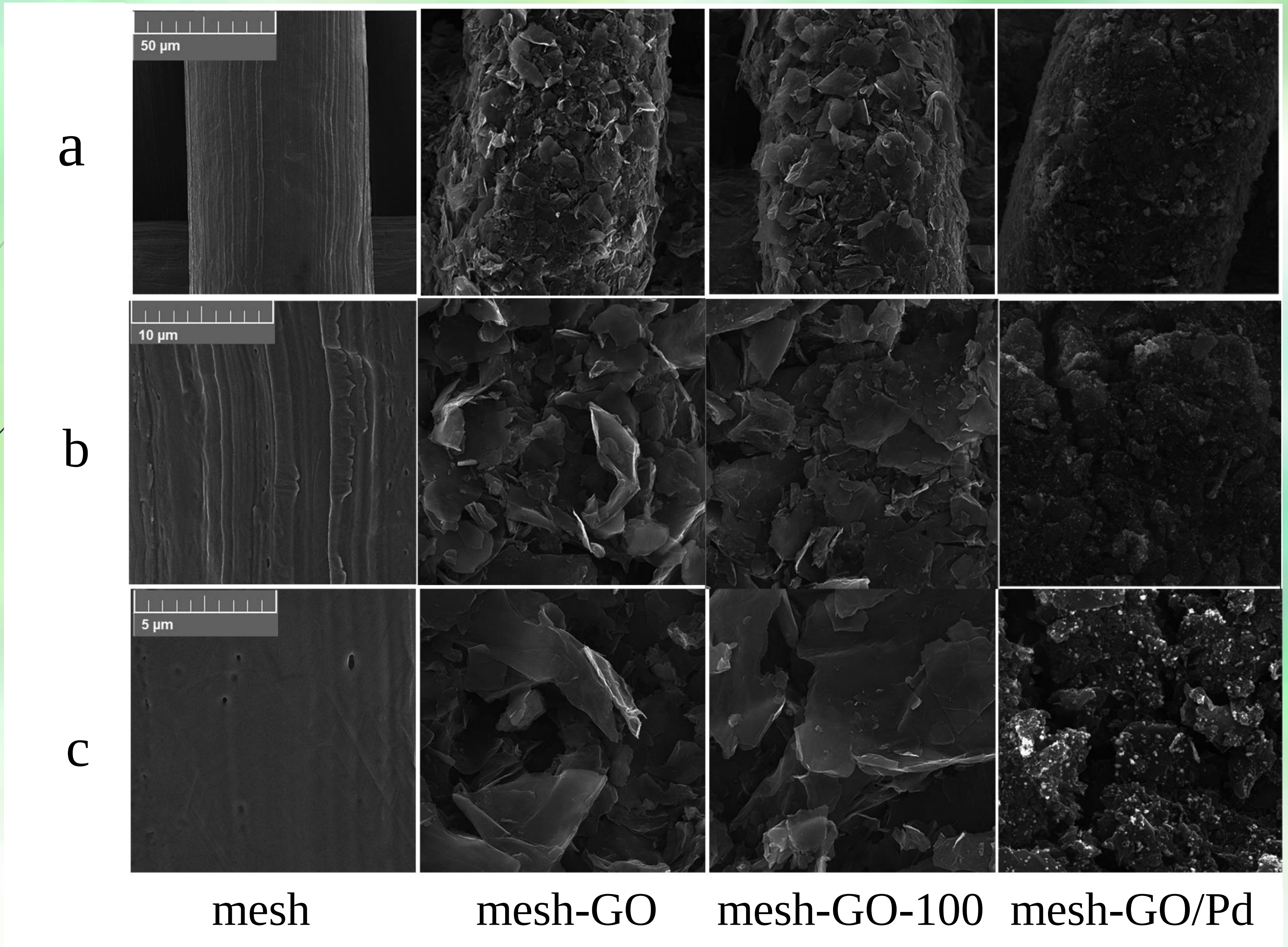


EDS

	C (A%)	O (A%)	Pd (A%)
mesh-GO/Pd	56.31	43.28	0.41

Characterization

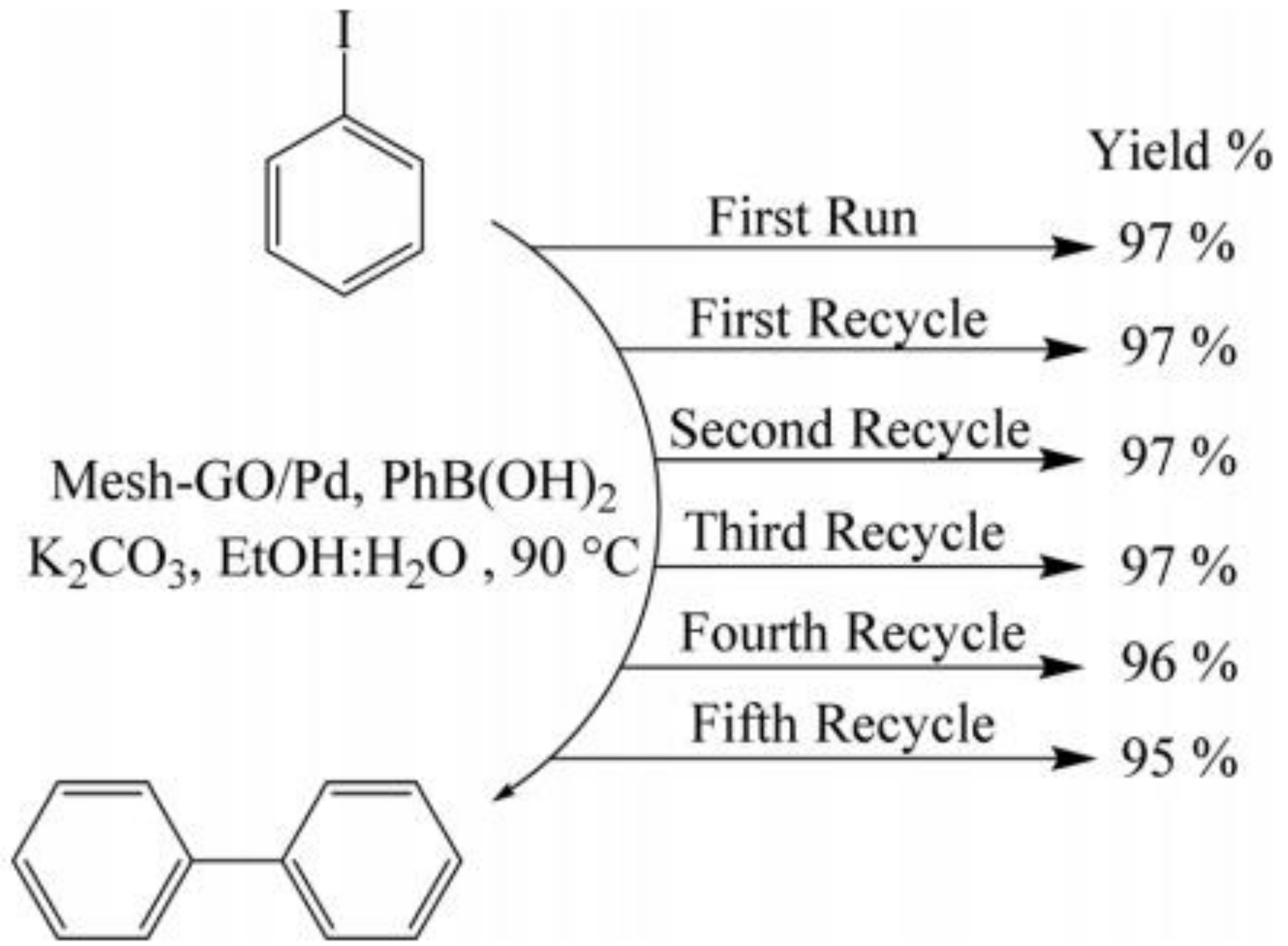
SEM



2

Application: Suzuki cross-coupling

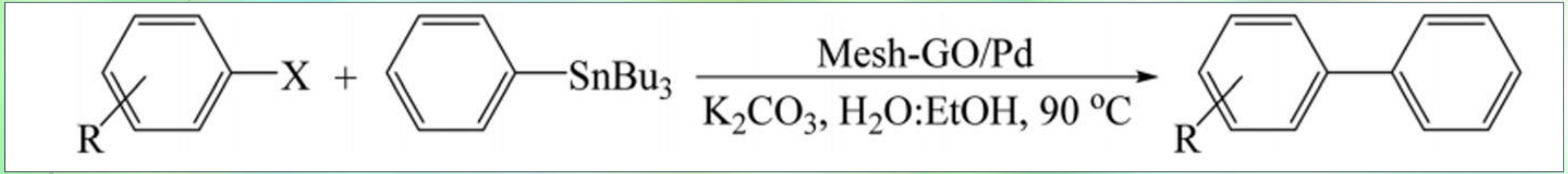
Reusability of the mesh-GO/Pd nanocomposite



Application: Stille cross-coupling reaction

2

Schematic of Stille reaction



Optimization condition

Entry	R	X	Time (h)	Yield[b] (%)
1	H	I	2	93 (90)[c]
2	4-OMe	I	2	92
3	4-Me	I	2	91
4	4-NO_2	I	2	92
5	4-COMe	I	2	95
6	H	Br	3	91
7	4-OMe	Br	3	91
8	4-NH_2	Br	3	92
9	4-NO_2	Br	3	95
10	4-COMe	Br	3	90

Conclusion

Bu-Ali Sina University

1. The parameters of EPD was optimized(3 mg/mL, 25 V, 10 min).
2. The EPD was successive to deposit thin film of GO on stainless steel mesh (mesh-GO).
3. The unique setup accomplished to immobilize Pd NPs on mesh-GO.
4. The attendance of Pd NPs was confirmed by different analysis.
5. The nanocatalyst possesses high efficiency (97%) in Suzuki- coupling reaction.
6. The nanocatalyst possesses high efficiency (95%) in Stille coupling reaction.
7. The nanocatalyst eliminated separation equipments.

Publication

Bu-Ali Sina University

IF (2019): 9.48

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Cite this: *Green Chem.*, 2019, **21**, 3319

Stainless steel mesh-GO/Pd NPs: catalytic applications of Suzuki–Miyaura and Stille coupling reactions in eco-friendly media†

Bahareh Feizi Mohazzab,[a] Babak Jaleh,*[a] Zahra Issaabadi,[b] Mahmoud Nasrollahzadeh *[b] and Rajender S. Varma *[c]