Deposition of palladium nanoparticles by the coating of carbonaceous layer from wastepaper-derived bio-oil

Tengyao Jiang,[a,b] *Yuan Yuan,*[b,c] *Sijia Liu,*[a] *Andrew J. Hunt**[b†] *and Gang Tan**[a]

[a]Department of Civil and Architectural Engineering, University of Wyoming, 1000 E. University Avenue, Dept. 3295, Laramie, WY 82071, USA

[b]Green Chemistry Centre of Excellence, Department of Chemistry, University of York, YO10 5DD, UK

[c]Marine Agriculture Research Center, Tobacco Research Institute of Chinese Academy of Agricultural Sciences, Qingdao, 266101, China

[†] Present Addresses: Materials Chemistry Research Center, Department of Chemistry, Faculty of Science, Khon Kaen University, Khon Kaen, Thailand

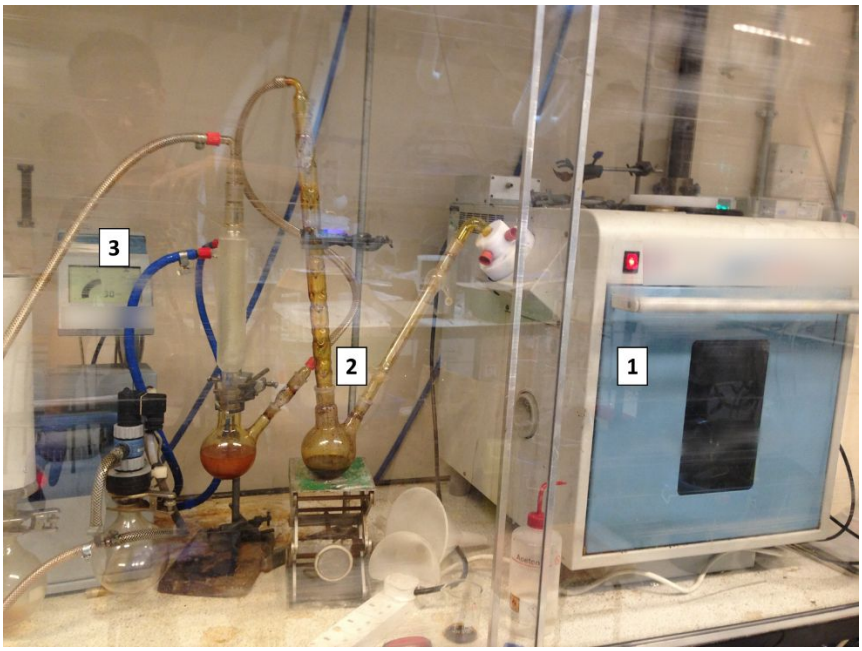


Figure S1 Set-up for microwave pyrolysis. (1) microwave reactor, (2) round bottom flask for collection of bio-oil, (3) vacuum pump

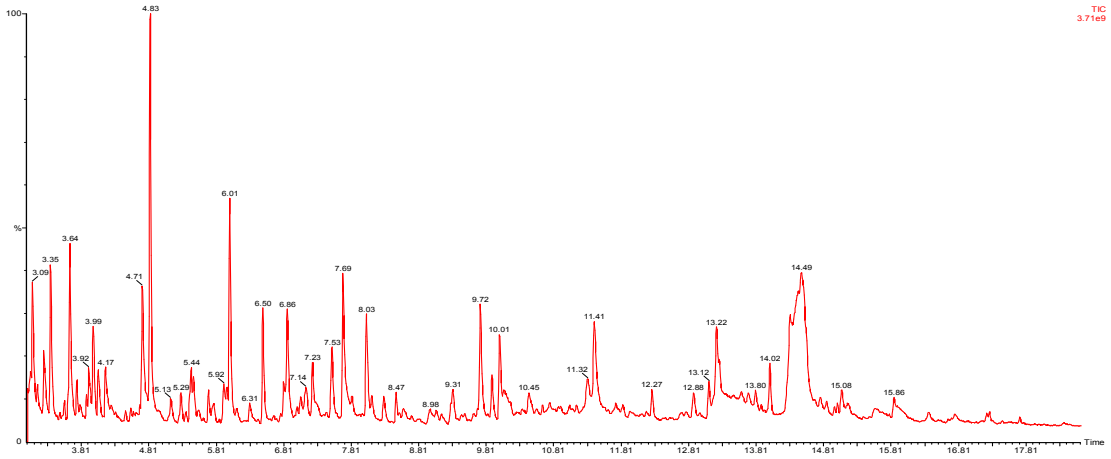


Figure S2 GC spectra of bio-oil pyrolyzed from wastepaper

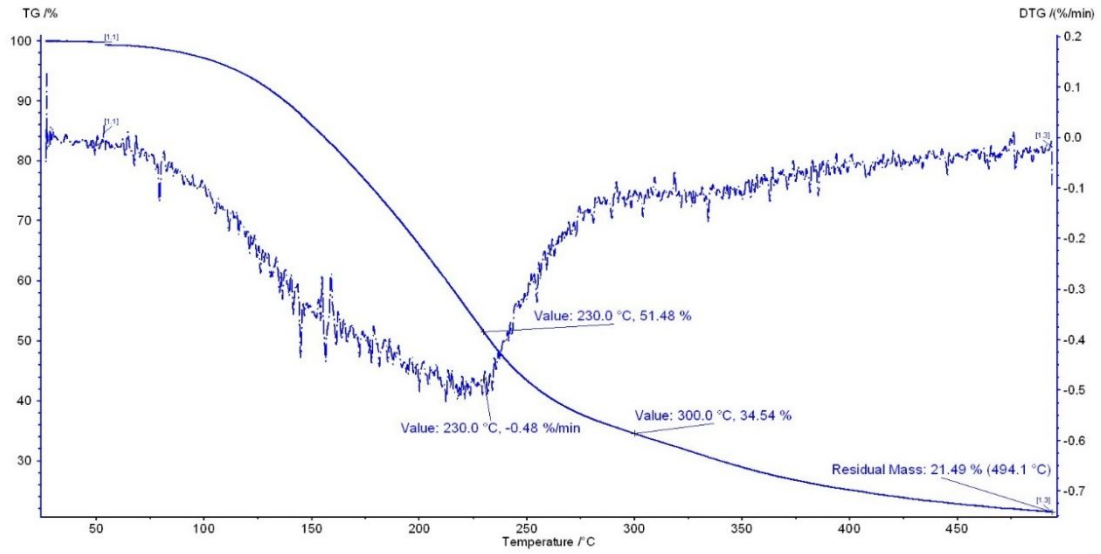


Figure S3 TG analysis of bio-oil sample

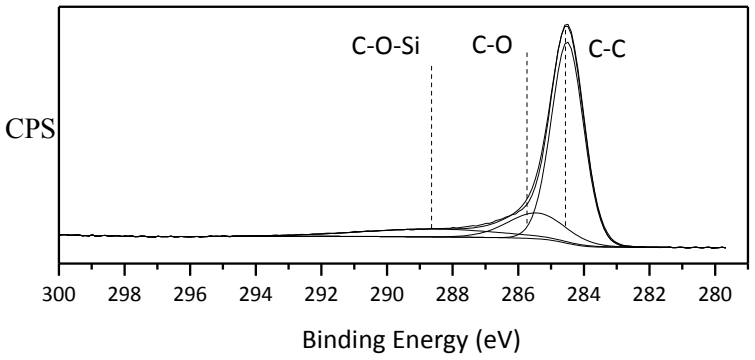


Figure S4 C_{1s} XPS spectra of the P-1 catalyst sample

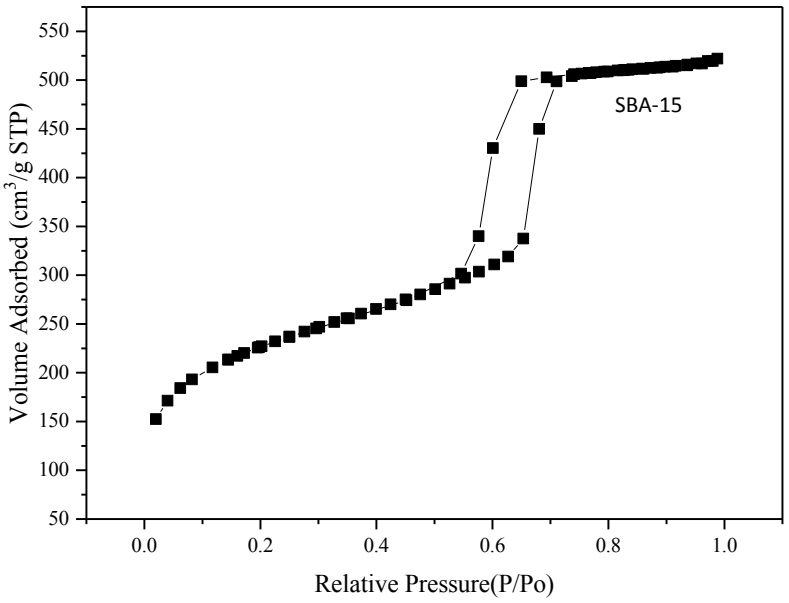


Figure S5 adsorption/desorption isotherm plot of the SBA-15 sample

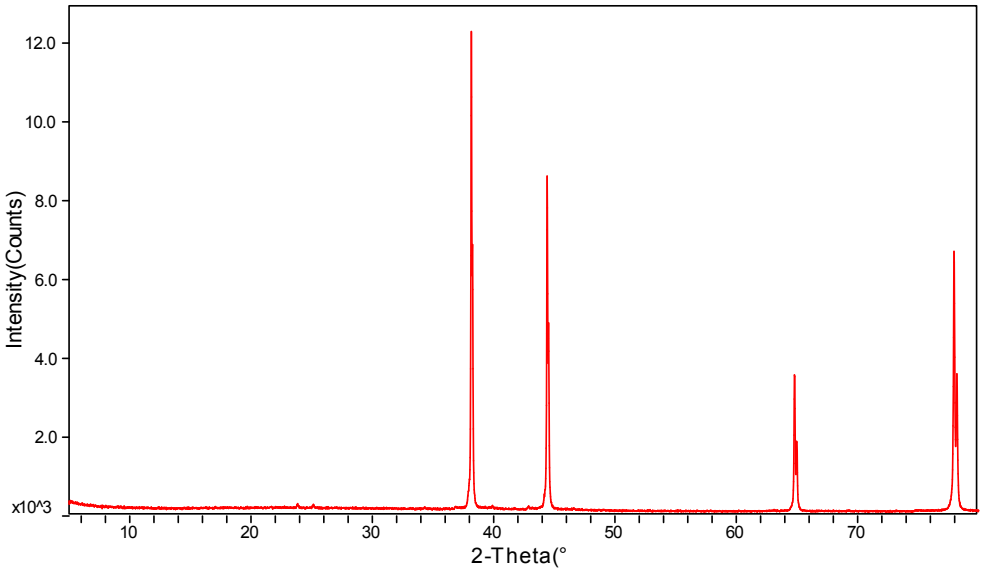


Figure S6 XRD pattern of the aluminium sample holder

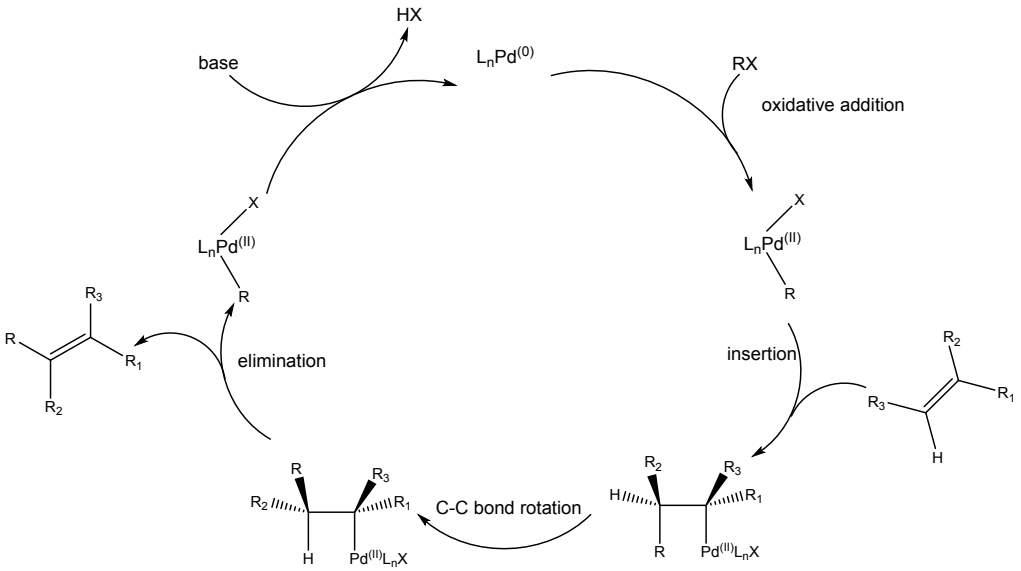
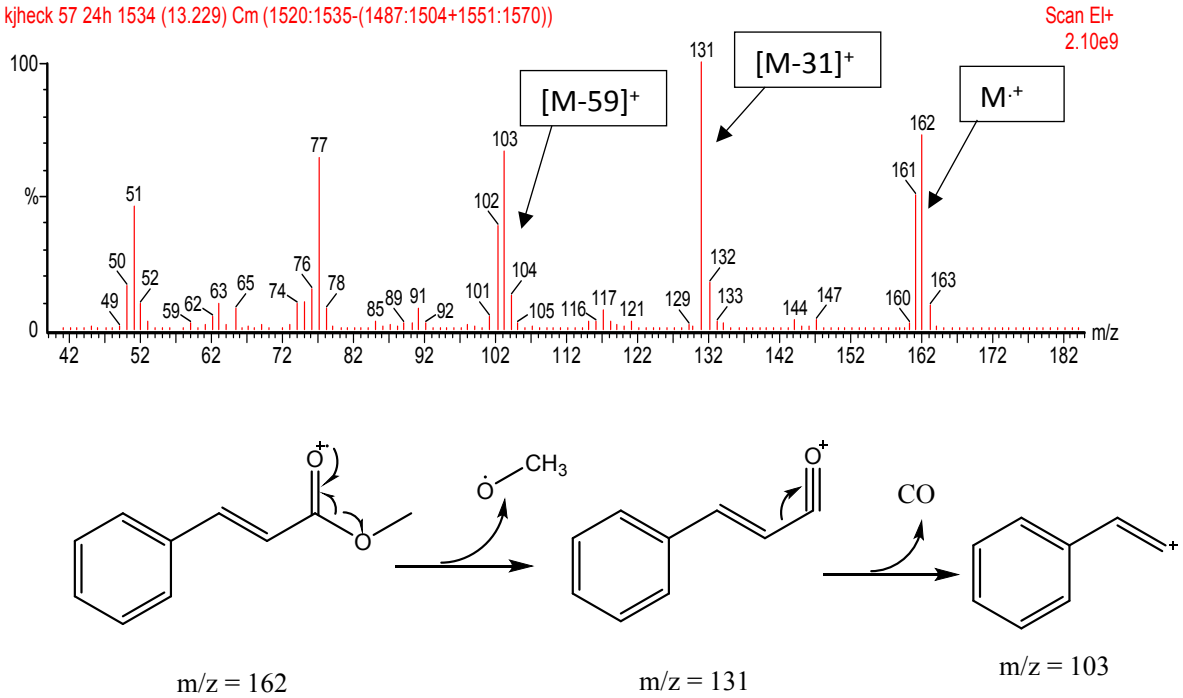
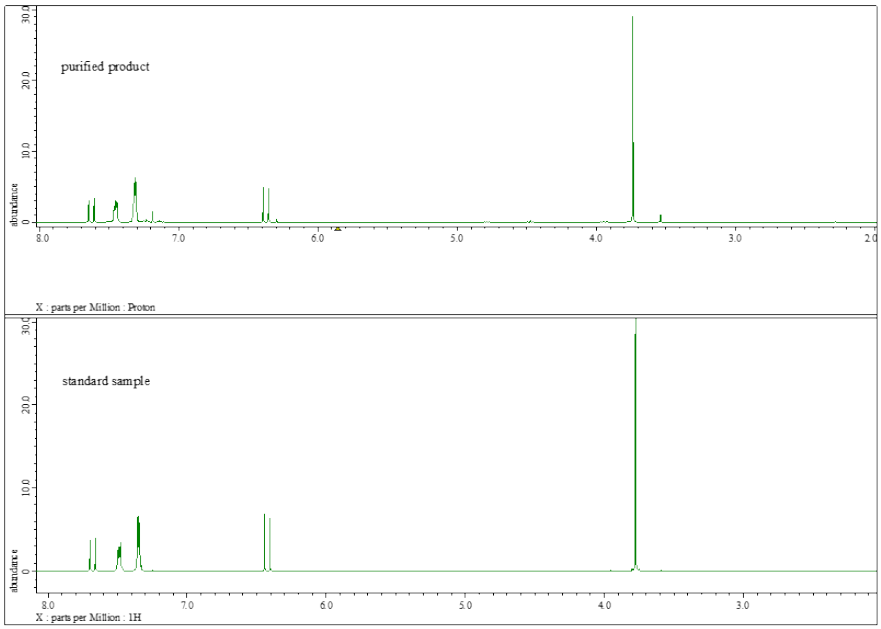


Figure S7 General catalytic cycle for Heck coupling reaction





Proton	Chemical shift/ppm	Integration, J value
1	3.73	s, 3H
2	6.37	d, 1H
3	7.62	d, 1H / J = 16 Hz
4, 4’	7.45	m, 2H
5, 5’	7.32	m, 2H
6	7.30	m, 1H

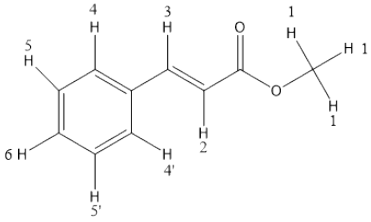


Figure S8 EI Mass spectra of methyl cinnamate and Formation of fragment ions m/z = 131 and m/z = 103; ^{1}H NMR analysis of as synthesized and standard methyl cinnamate

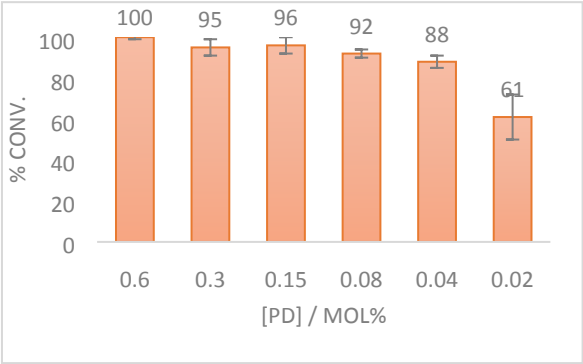


Figure S9 Conversion rate of the Heck reaction using different amounts of P-1 sample in PC