Supplementary Information (SI) for New Journal of Chemistry.

Hormonal-mediated *Cicer arietinum* L. Leaf Extract Assisted Synthesis of Ternary g-C_3N_4/$ZrTiO_4$/V_2O_5 Nanocomposite for Photocatalytic Remediation of Organic Pollutants

Aakash Venkatesan [a], Aatika Nizam [a*], Letcy V Theresa [a], Jobi Xavier [b], Nagaraju G [c]

[a] Department of Chemistry, Christ University, Hosur Road, Bangalore

[b] Department of Life Sciences, Christ University, Hosur Road, Bangalore

[c] Energy Materials Research Laboratory, Department of Chemistry, Siddaganga Institute of Technology, Tumakuru-572103, India

Corresponding author
Email ID: aatika.nizam@christuniversity.in

3. Results and Discussions

3.1. Plant Extract Characterizations

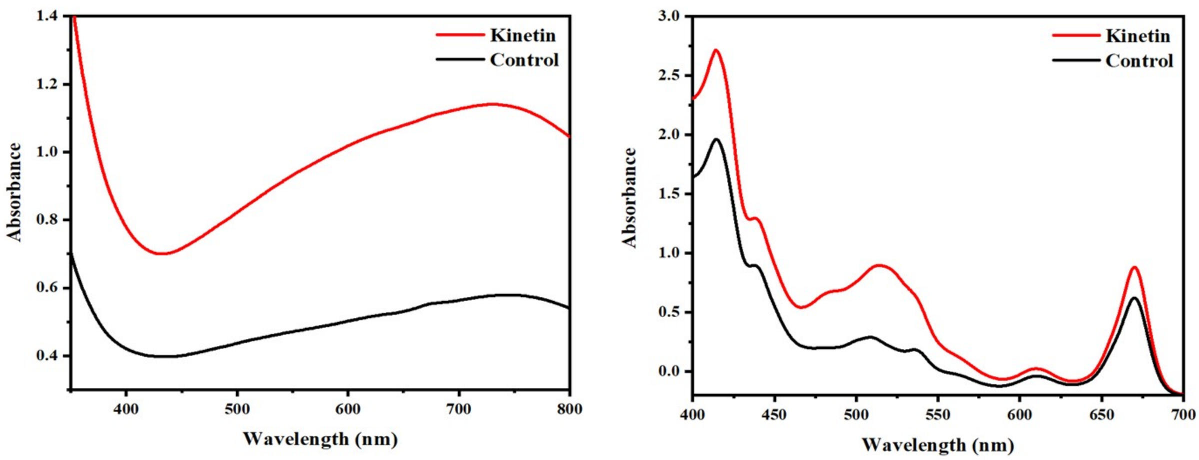


Figure S1: UV-Vis spectrum of (a) Total Phenol content estimation (b) Proline content estimation

3.2. Nanocomposite Characterization

3.2.3. UV-Vis analysis

Table S1: Optical band gap, valence band, and conduction band energies with respect to NPs

Type of Nanoparticle	*Optical band gap energy (eV)*	*Valence band energy (eV)*	*Conduction band energy (eV)*
g-ZTC	4.04	2.95	-1.09
g-ZTK	3.75	2.81	-0.95

3.3. Photo-Catalytic studies of g-ZTK

3.3.1. Photodegradation of organic dyes

3.3.1.2. Kinetic Studies

Table S2: Rate constant values (k) for varying (a) Dyes (b) Catalytic dosage (c) Dye concentration (d) pH Value

Dyes	***Acriflavine Hydrochloride***	***Rose Bengal***	***Indigo Carmine***	***Methylene Blue***
k value (min^{-1})	4.35 ×10^{-3}	12.75 ×10^{-3}	1.56 ×10^{-3}	1.26 ×10^{-3}

Catalytic Dosage (mg)	***10***	***20***	***30***	***40***
k value (min^{-1})	12.75 ×10^{-3}	5.57 ×10^{-3}	5.15 ×10^{-3}	4.24 ×10^{-3}

Dye Concentration (ppm)	***10***	***20***	***30***	***40***
k value (min^{-1})	8.77 ×10^{-3}	12.75 ×10^{-3}	4.61 ×10^{-3}	3.46 ×10^{-3}

pH values	***5***	***7***	***9***
k value (min^{-1})	13.34 ×10^{-3}	12.75 ×10^{-3}	5.85 ×10^{-3}

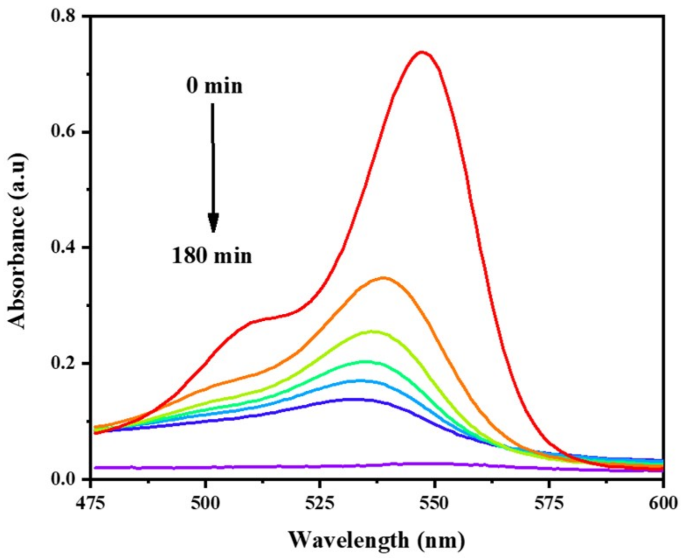


Figure S2: Absorption spectra of optimized photocatalytic degradation of Rose Bengal dye by g-ZTK NPs

3.3.1.4. Recyclability and Photostability studies

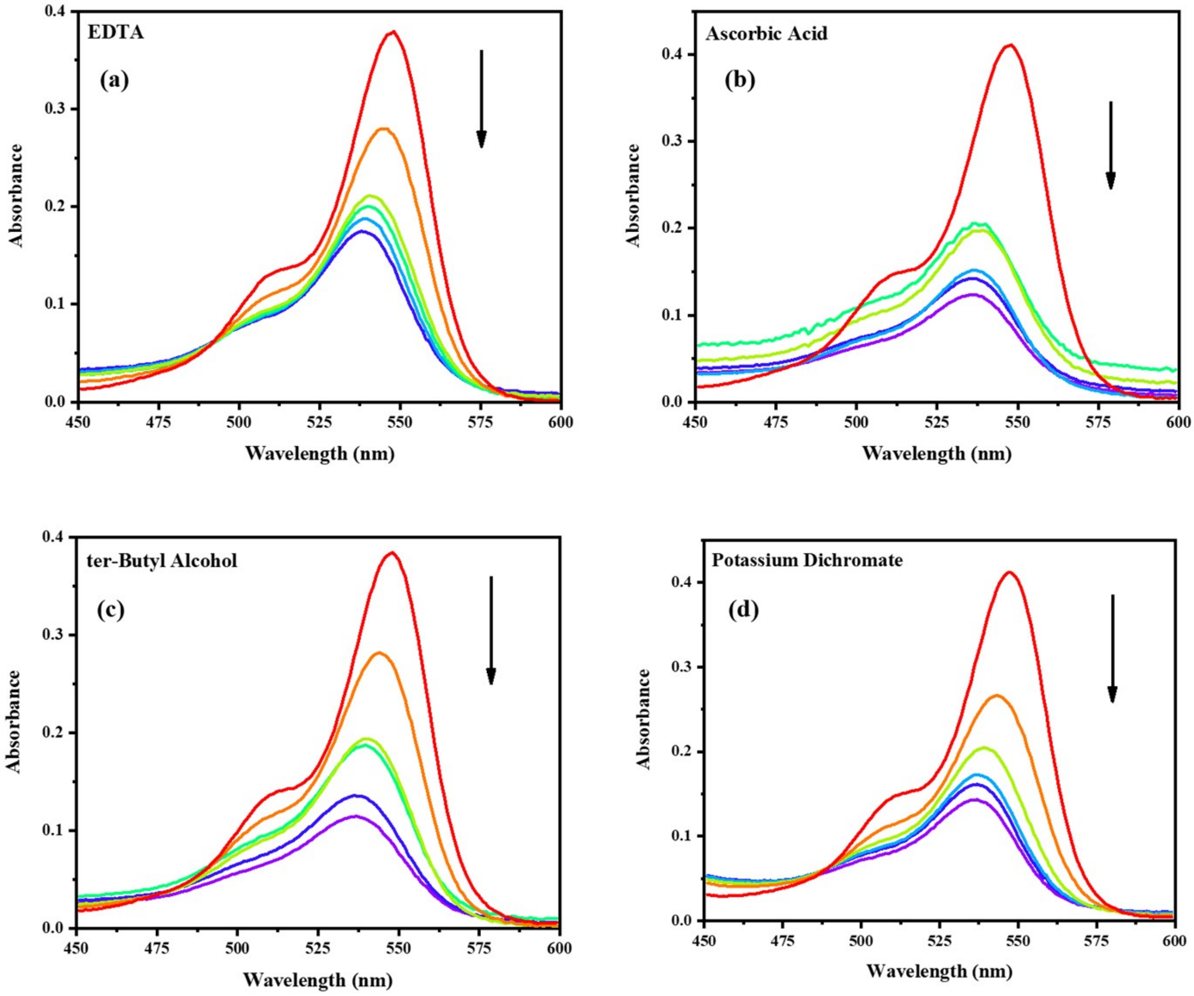


Figure S3: Absorption spectra of Scavengers Studies (a) EDTA (b) Ascorbic Acid (c) TBA (d) Potassium dichromate

3.3.2. Photooxidation of Aromatic Alcohols

Spectral data of substituted aldehyde compounds

Compound 3a: Colourless liquid, bp = 177-178 °C.

Compound 3b: Light yellow powder, ^{1}H-NMR: δ, ppm (DMSO-d6): 8.186-8.164 (d, 2H), 8.419-8.440 (d, 2H), 10.175 (s, 1H).

Compound 3c: Colourless liquid, ^{1}H-NMR: δ, ppm (DMSO-d6): 3.809-3.875 (q, 3H), 7.083-7.118 (m, 2H), 7.840-7.875 (m, 2H), 9.868 (s, 1H).

Compound 3d: White powder, ^{1}H-NMR: δ, ppm (DMSO-d6): 3.050 (s, 6H), 6.778-6.814 (m, 2H), 7.674-7.710 (m, 2H), 9.676 (s, 1H).

Compound 3e: White powder, ^{1}H-NMR: δ, ppm (DMSO-d6): 7.680-7.712 (m, 2H), 7.925-7.958 (m, 2H), 10.013 (s, 1H).

Compound 3f: Colourless liquid, ^{1}H-NMR: δ, ppm (DMSO-d6): 7.505-7.542 (t, 1H), 7.594-7.710 (q, 2H), 7.853-7.872 (d, 1H).

Compound 3g: Colourless liquid, ^{1}H-NMR: δ, ppm (DMSO-d6): 7.385-7.429 (q, 2H), 7.968-8.004 (m, 2H), 9.976 (s, 1H).

Compound 3h: Colourless liquid, ^{1}H-NMR: δ, ppm (DMSO-d6): 6.930-7.011 (m, 2H), 7.485-7.652 (m, 1H), 7.656-7.676 (t, 1H), 10.261 (s, 1H), 10.716 (s, 1H).

Compound 3i: White crystalline powder, ^{1}H-NMR: δ, ppm (DMSO-d6): 6.979-7.001 (d, 1H), 7.646-7.675 (q, 1H), 7.719-7.725 (d, 1H), 10.217 (s, 1H), 10.990 (s, 1H).

Compound 3j: Brown liquid, ^{1}H-NMR: δ, ppm (DMSO-d6): 6.770-6.783 (q, 1H), 7.529-7.539 (q, 1H), 8.092-8.096 (t, 1H), 9.620-9.621 (d, 1H).

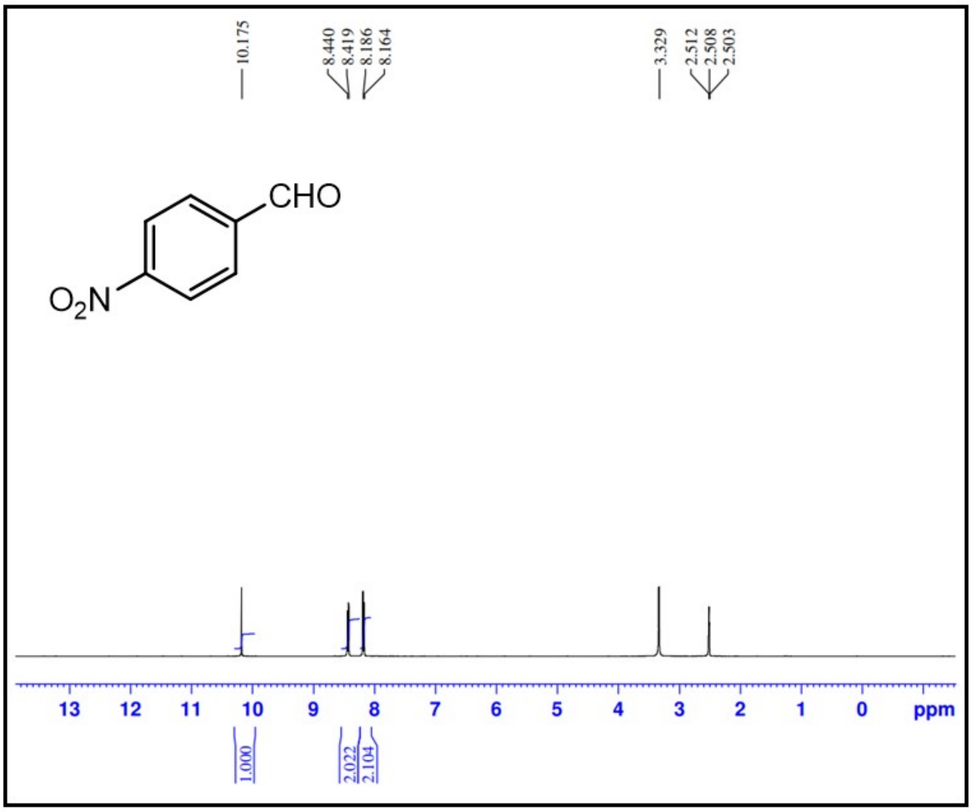


Figure S4: ^{1}H-NMR Spectrum of Compound 3b

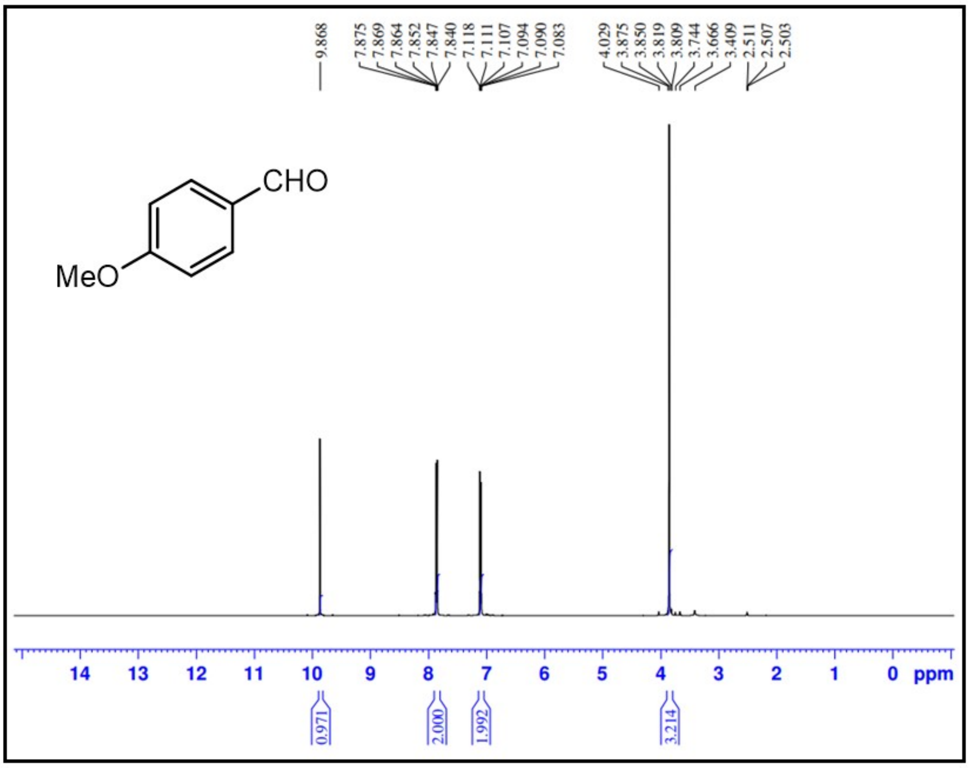


Figure S5: ^{1}H-NMR Spectrum of Compound 3c

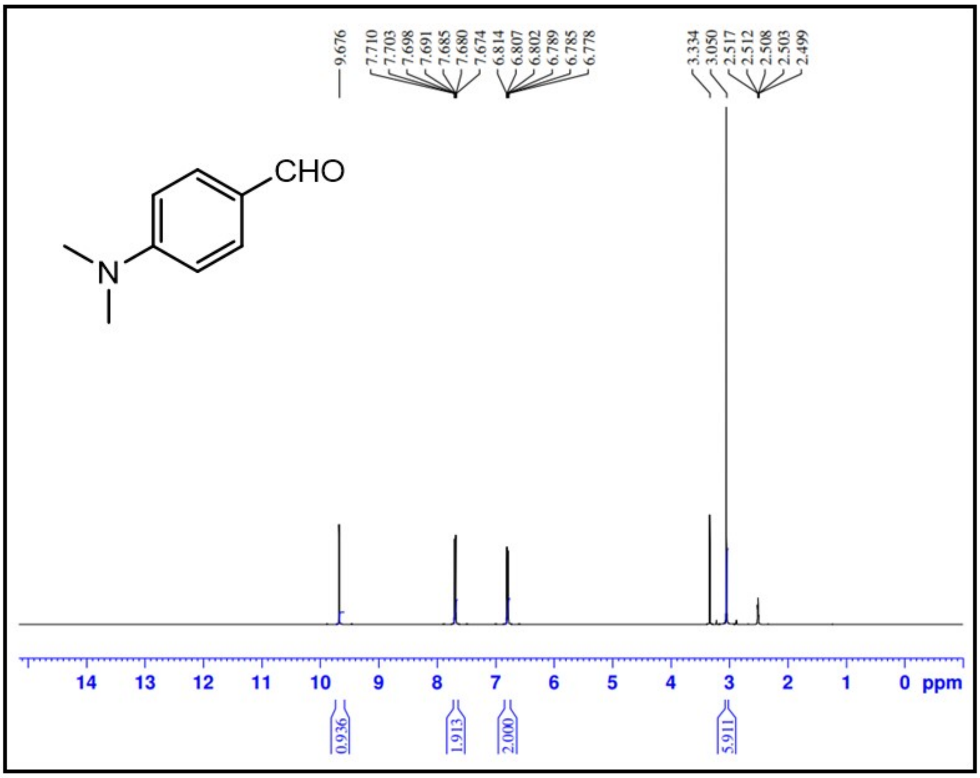


Figure S6: ^{1}H-NMR Spectrum of Compound 3d

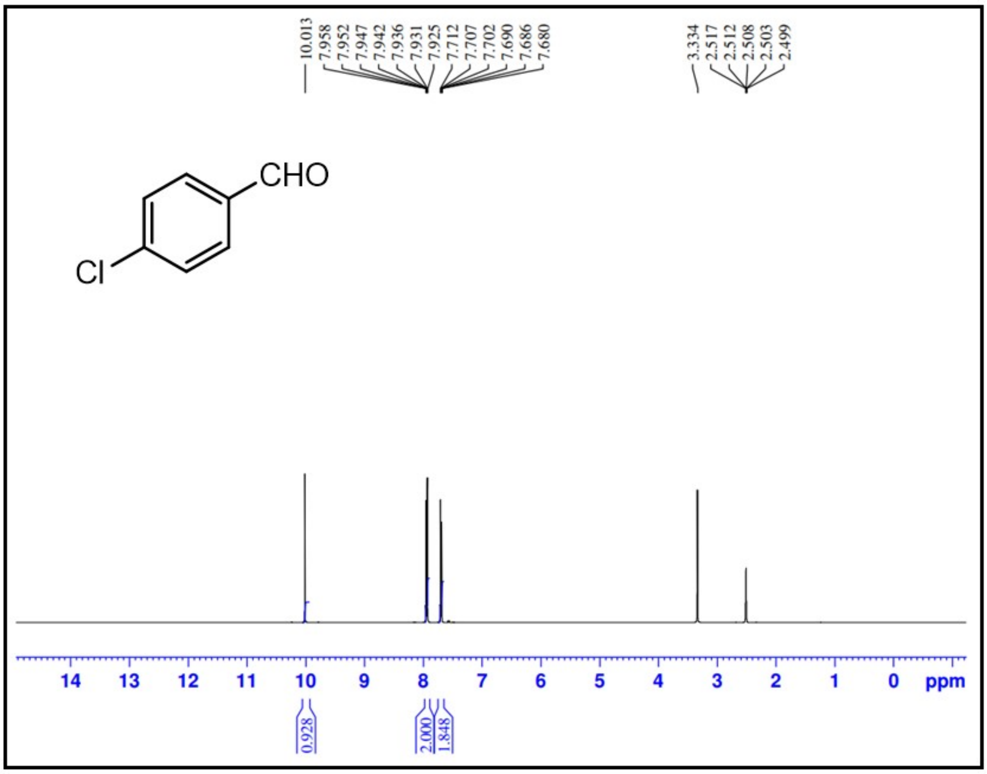


Figure S7: ^{1}H-NMR Spectrum of Compound 3e

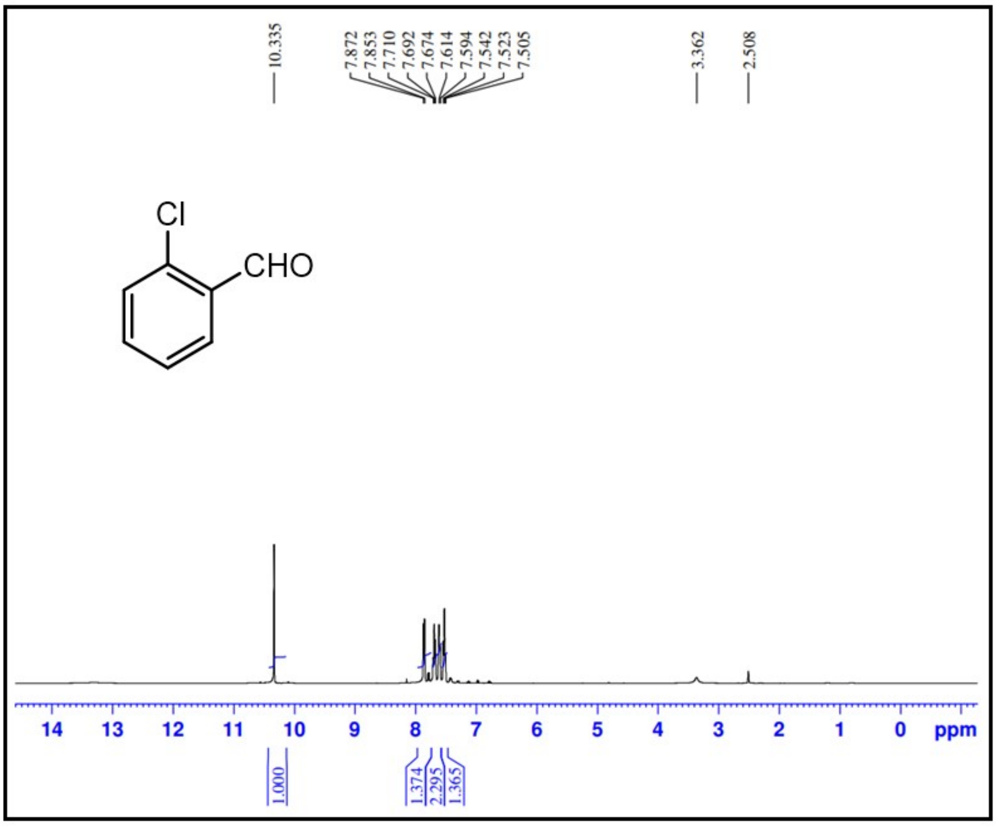


Figure S8: ^{1}H-NMR Spectrum of Compound 3f

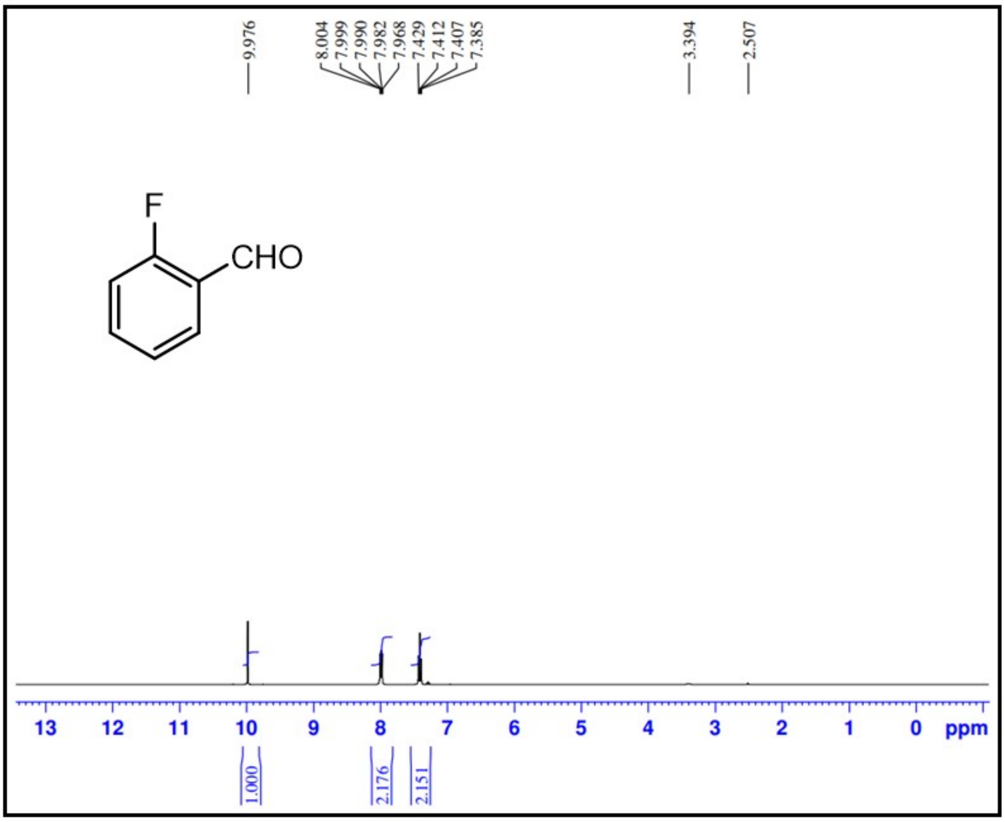


Figure S9: ^{1}H-NMR Spectrum of Compound 3g

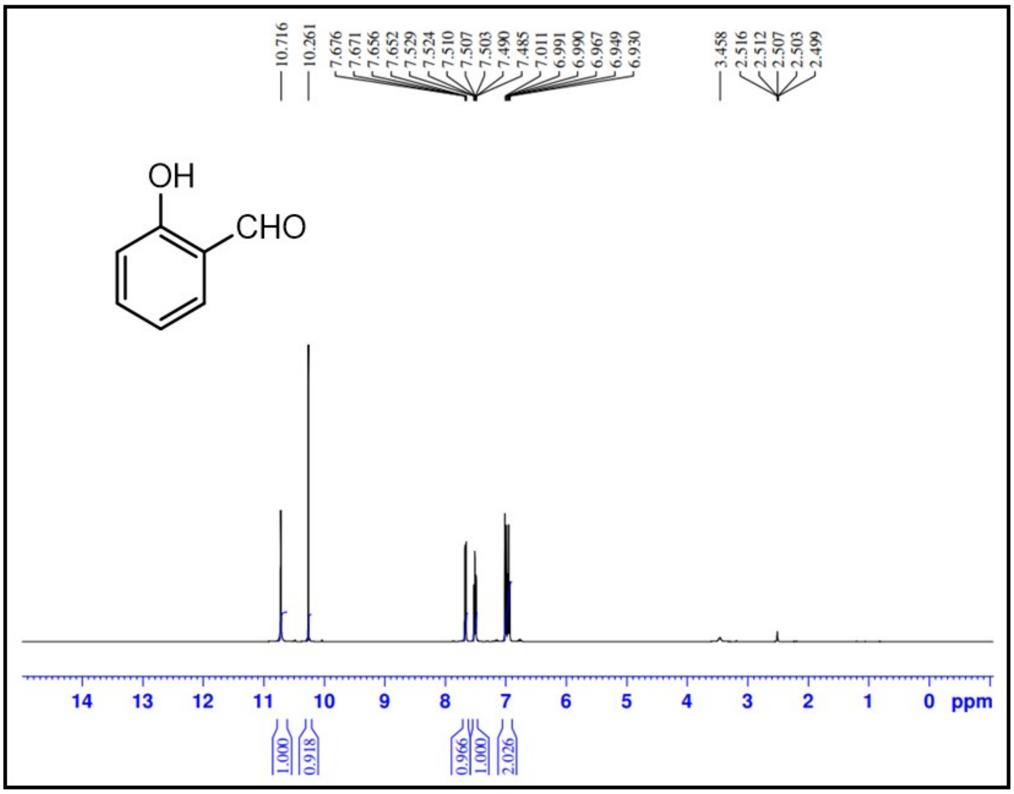


Figure S10: ^{1}H-NMR Spectrum of Compound 3h

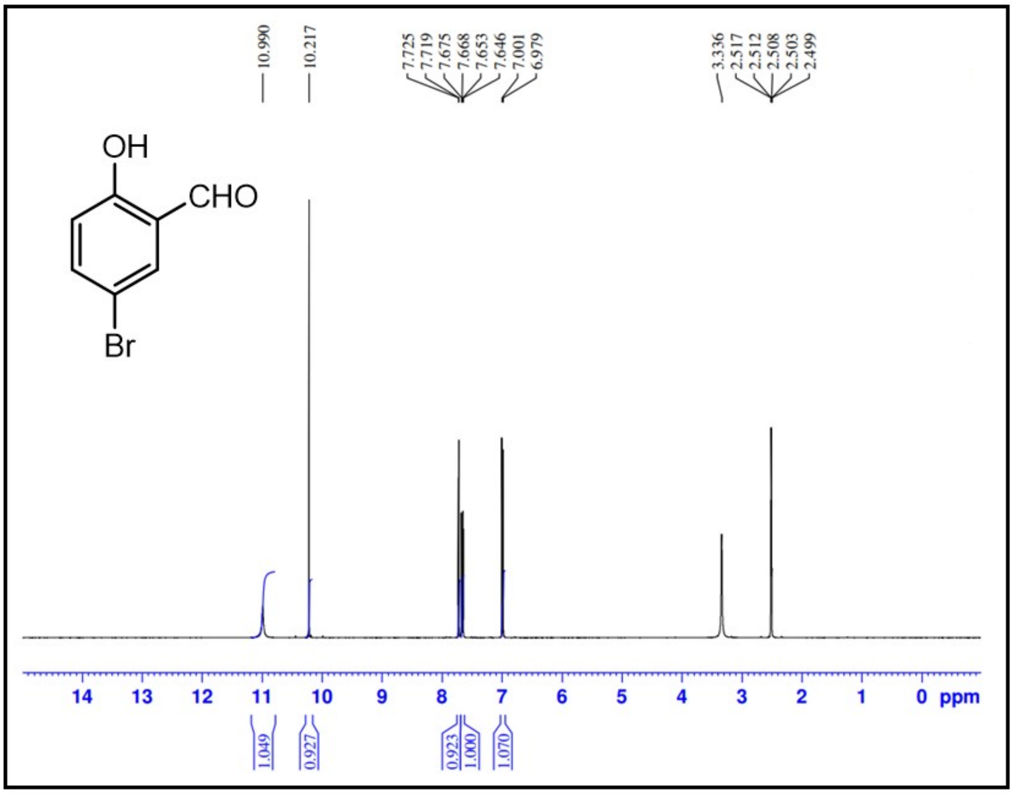


Figure S11: ^{1}H-NMR Spectrum of Compound 3i

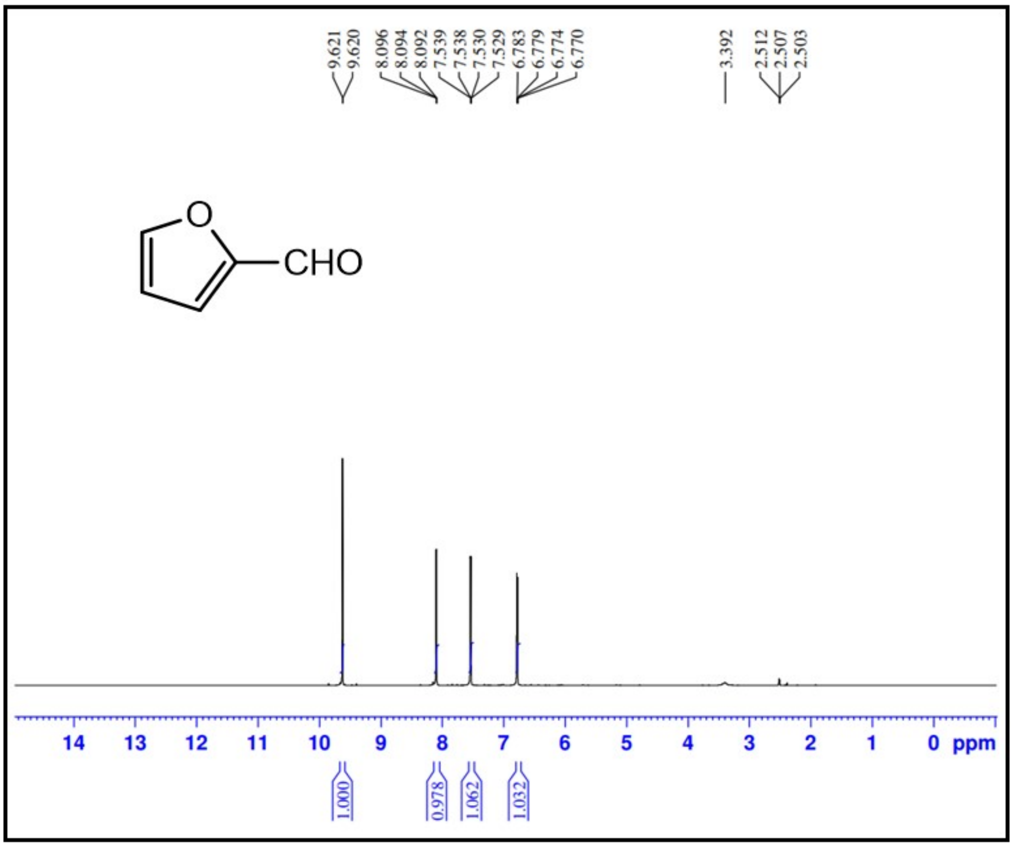
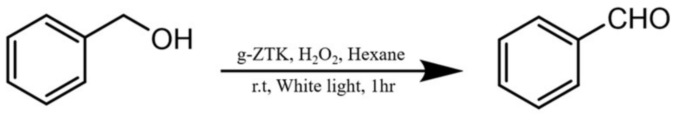


Figure S12: ^{1}H-NMR Spectrum of Compound 3j

3.3.2.2. Green Chemistry Metrics



Catalyst Mass = 0.030 g
Reaction Solvent Mass = 3.274 g
By-products: H_2O
Yield: 92 %

Atom Economy (AE): $\frac{106.12\ g/mol}{(108.14\ + 34.01)\ g/mol} \times 100 = \ 77.8\ \%$ %

Generalized reaction mass efficiency (gRME): $\frac{0.1061\ g}{0.1489\ g} \times 100 = \ 71.3\ \%$

E-factor: $\frac{0.1489 - 0.1061\ g}{0.1061\ g} = 0.40$

Carbon Efficiency: 100 %
TON: 27.9
TOF: 27.9 h^{-1}
Eco-scale: 81

3.3.2.3. Reusability of g-ZTK Nano-catalyst

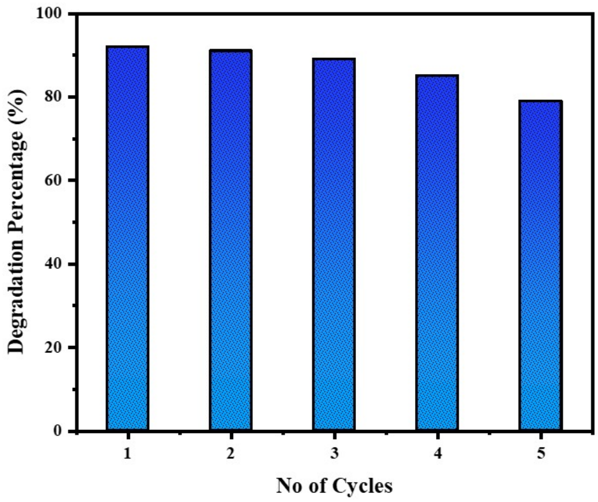


Figure S13: Reusability of g-ZTK catalyst for the model reaction under the same reaction conditions.