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Supplementary Information

Study of Biodiesel Photodegradation Through Reactions Catalyzed by Fenton's Reagent

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The absorbance spectrum for ethanol compared with the absorbance spectrum of biodiesel is shown in Figure S1.

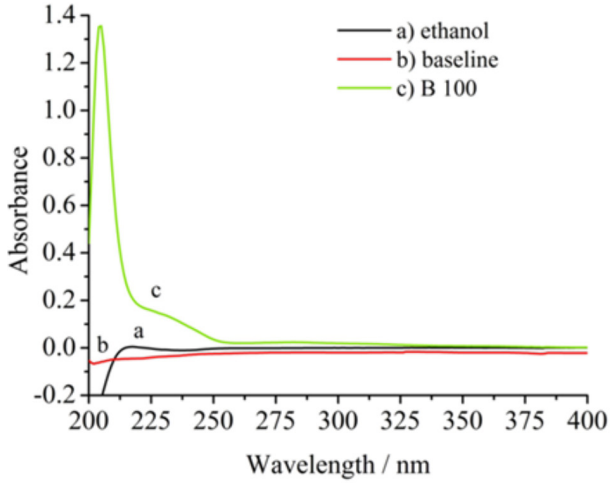

Figure S1. UV-region spectrophotometry of the biodiesel (ethanol dilution rate, 1:1000) (■); ethanol (99.3%, FMaia) (■); and baseline (■).

It is possible to use ethanol as solvent for the organic phase as it does not interfere with their absorbance spectra. Figure S2 shows the absorption spectra for the organic phase and the aqueous phase which have undergone the action of Fenton's reagent and light at various periods of time.

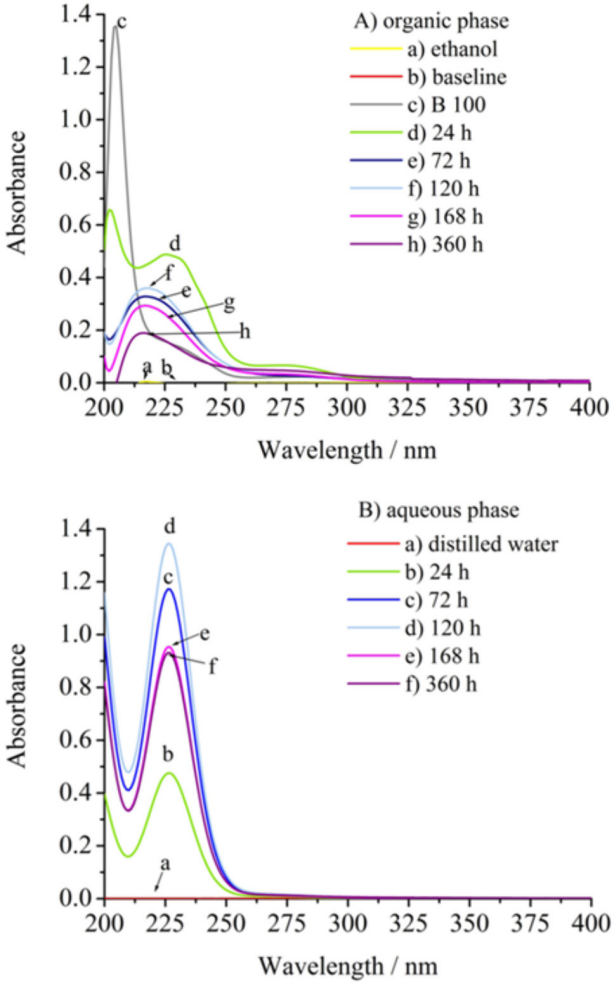

Figure S2. Absorbance spectra of: a) organic phase and b) the aqueous phase irradiated for 360 h using Fenton's reagent: (■) distilled water (baseline), (■) ethanol (baseline), (■) biodiesel undegraded, (■) 24 h, (■) 72 h, (■) 120 h, (■) 168 h, (■) 360 h. Aqueous phase was diluted with distilled water, 1:1000 and the organic layer diluted with ethanol, 1:10000. For degradation of 1 mL biodiesel, Fenton's reagent was used $[Fe^{2+}]:[H_2O_2] = 0.65$, 1.54 mL was added to a mixture of ferrous sulfate heptahydrate concentration of $[Fe^{2+}] = 5.34 \times 10^{-3}$ mol L^{-1} and $[H_2O_2] = 8.05 \times 10^{-3}$ mol L^{-1} in the presence of light.

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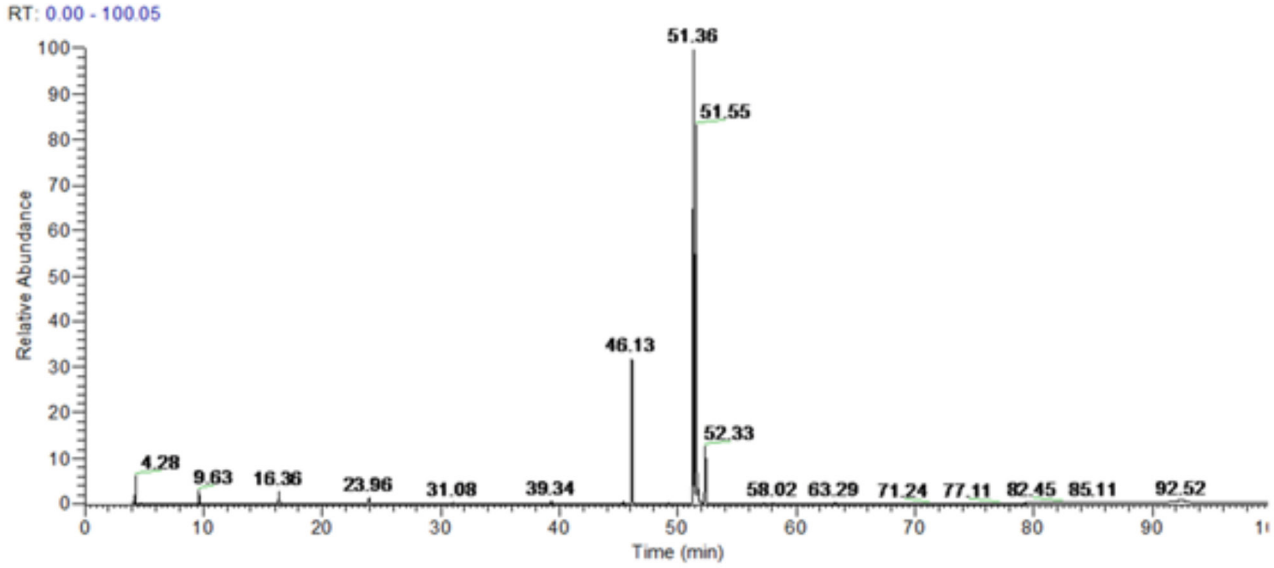

Figure S3. GC/MS chromatogram of B 100 dissolved in dichloromethane.

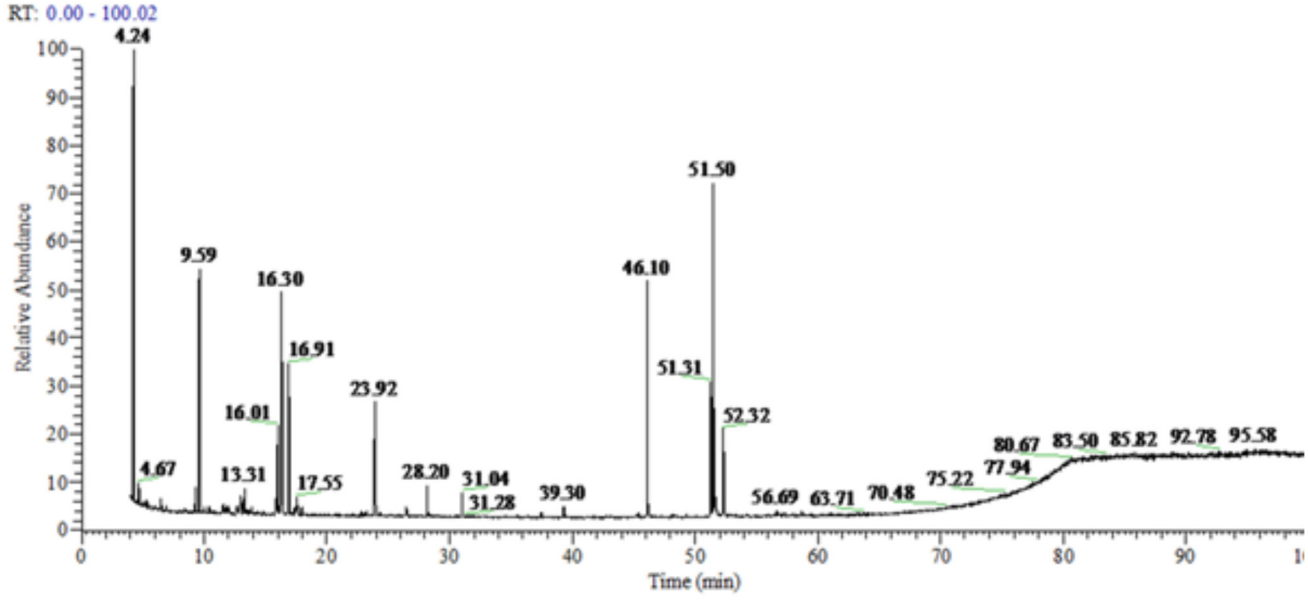

Figure S4. GC/MS chromatogram of degraded biodiesel by photo-Fenton ($[Fe^{2+}]:[H_2O_2]$ = 0.65, 1.54 mL) for 24 h, dissolved in dichloromethane.

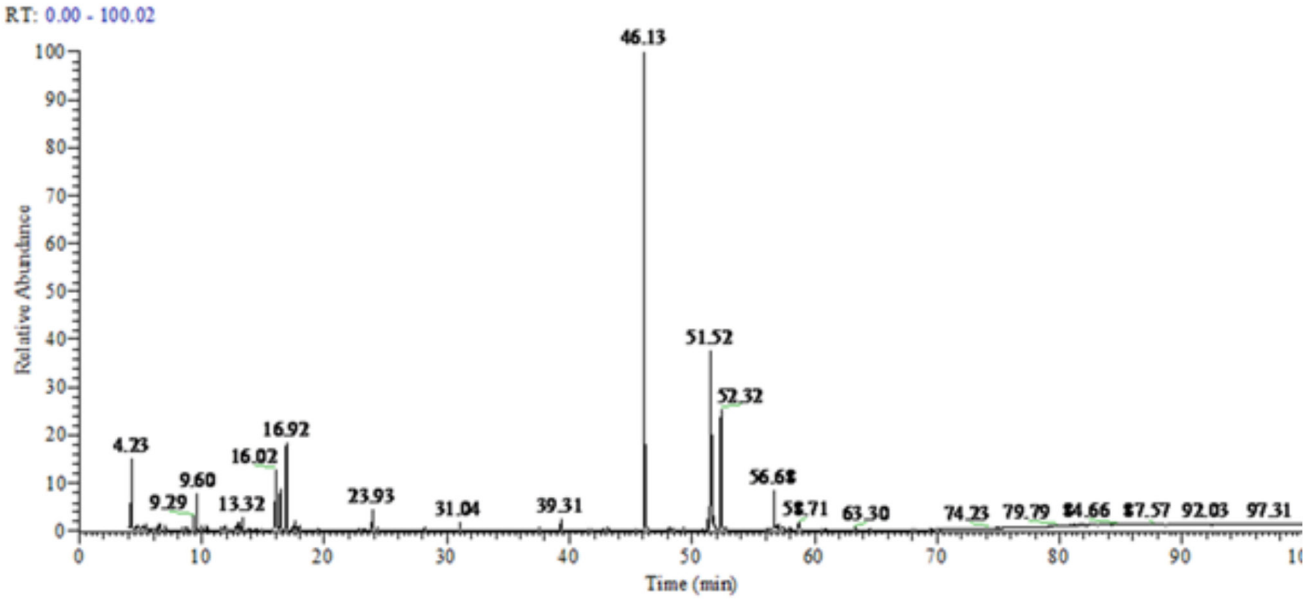

Figure S5. GC/MS chromatogram of degraded biodiesel by photo-Fenton ([Fe^{2+}]:[H_2O_2] = 0.65, 1.54 mL) for 96 h, dissolved in dichloromethane.

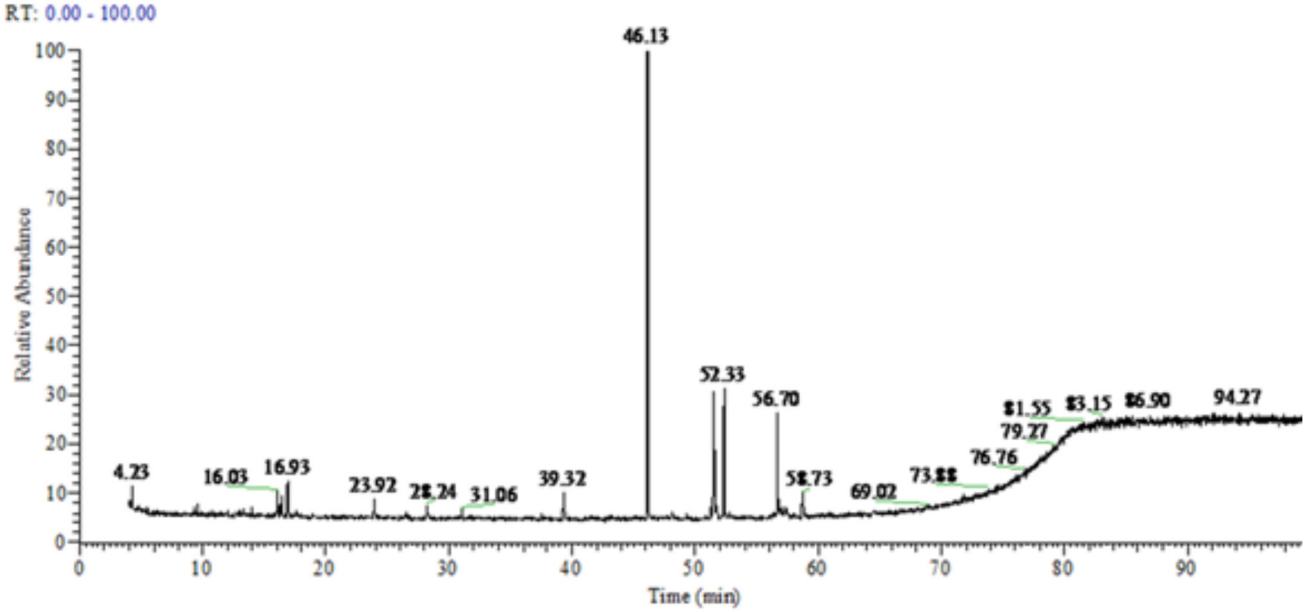

Figure S6. GC/MS chromatogram of degraded biodiesel by photo-Fenton ([Fe^{2+}]:[H_2O_2] = 0.65, 1.54 mL) for 168 h, dissolved in dichloromethane.

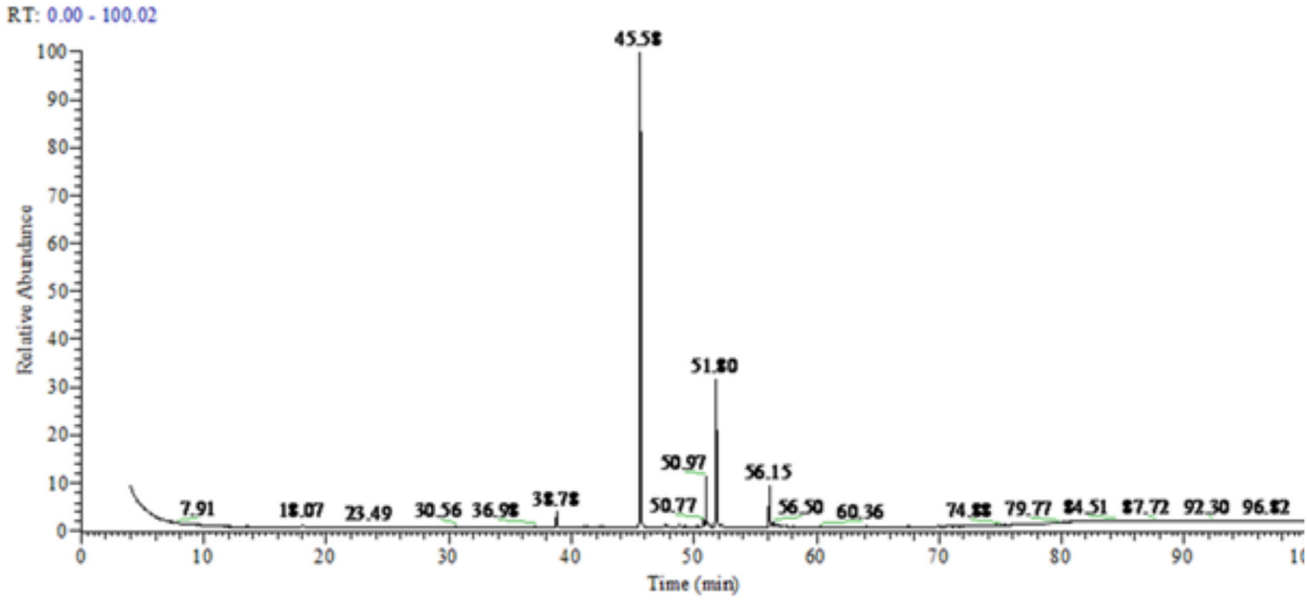

Figure S7. GC/MS chromatogram of degraded biodiesel by photo-Fenton ($[Fe^{2+}]:[H_2O_2]$ = 0.65, 1.54 mL) for 360 h, dissolved in dichloromethane.

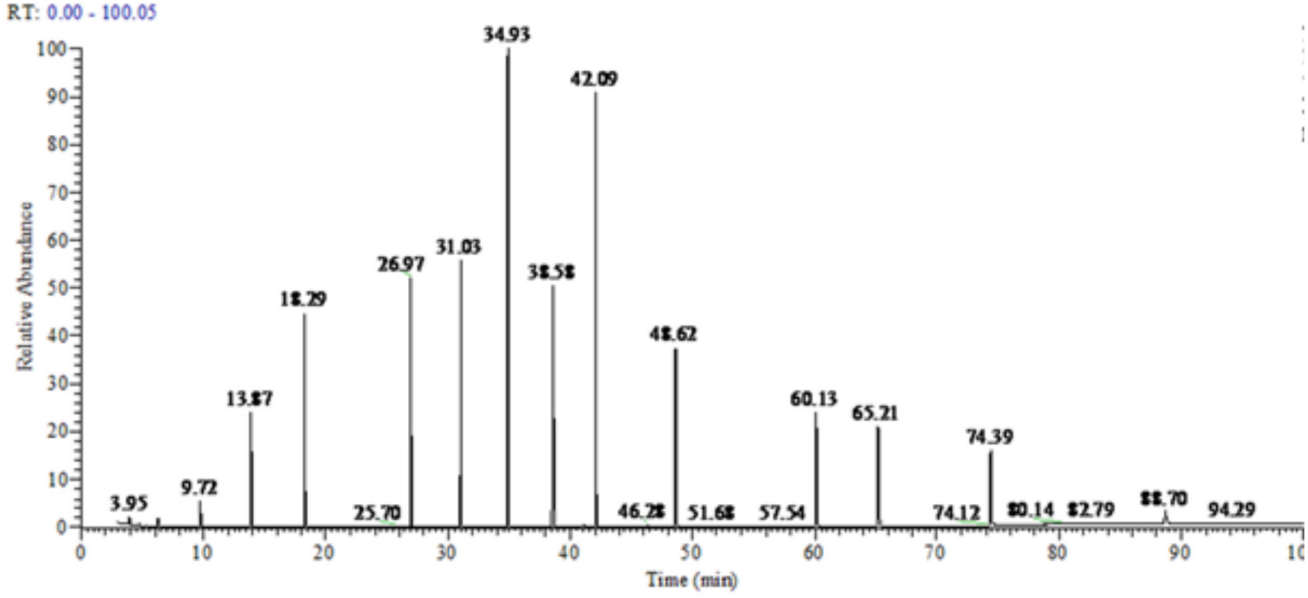

Figure S8. GC/MS chromatogram of a mixture of alkane standards (C9-C21) dissolved in dichloromethane.

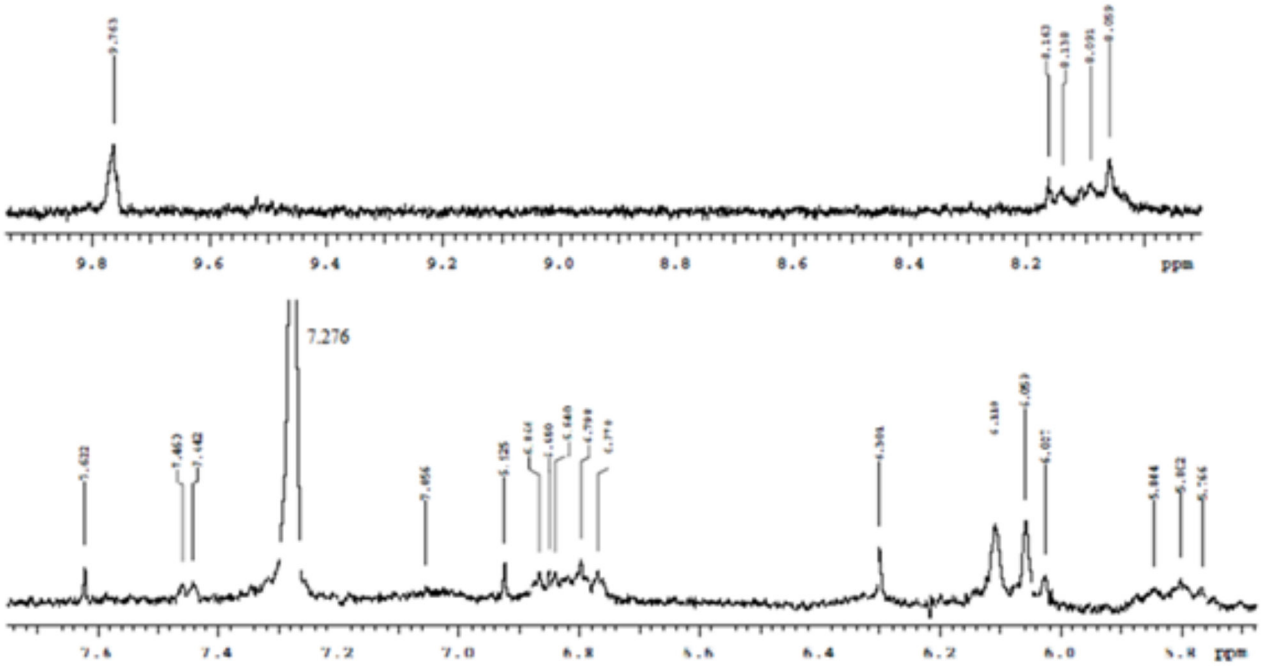

Figure S9. ^{1}H NMR spectrum of degraded biodiesel by photo-Fenton ([Fe^{2+}]:[H_2O_2] = 0.65, 1.54 mL) for 360 h. Typical shifts can be observed for aldehyde (9.4-10.0 ppm) and carboxylic acids (about 8 ppm), whereas the chemical shifts between 6.0 and 6.4 ppm are due to the conjugated bonds of these compounds.