Supplementary Information (SI) for Environmental Science: Nano.

SUPPORTING INFORMATION

Interfacial behavior of Ceria grown on Graphene oxide and its use for hydrolytic and photocatalytic decomposition of bisphenols A, S, and F

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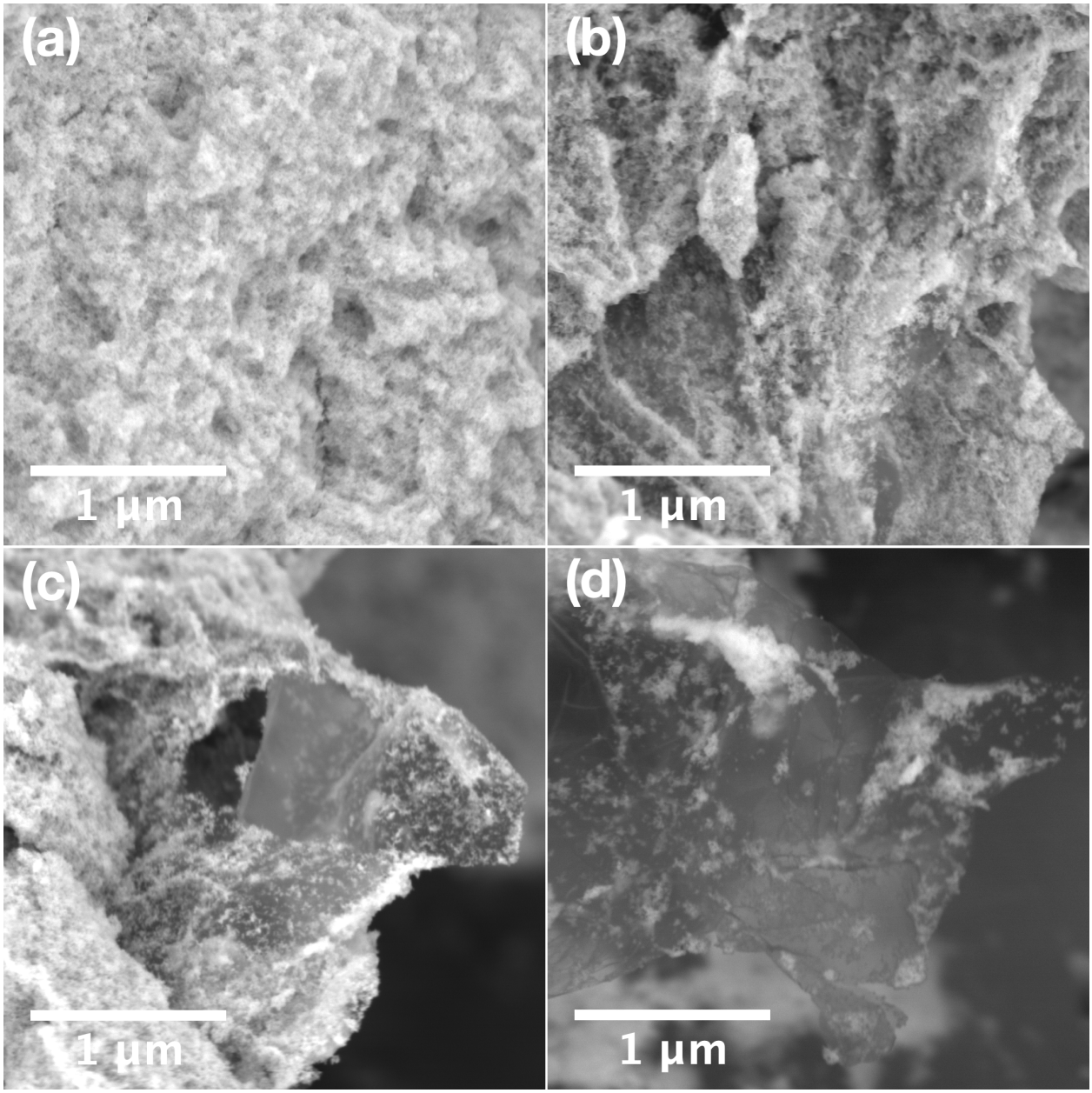

Figure S1. SEM images of (a) CeO_2, (b) CeGO5, (c) CeGO10, (d) CeGO20

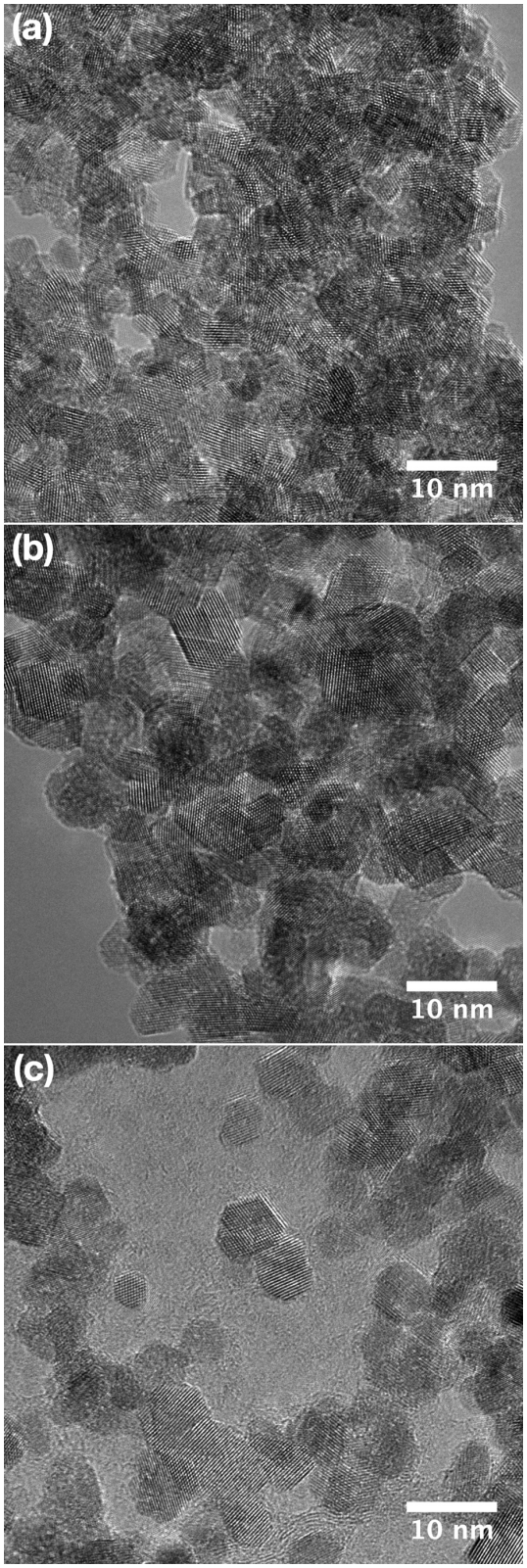

Figure S2. TEM images of (a) CeO_2, (b) CeGO10, (c) CeGO20

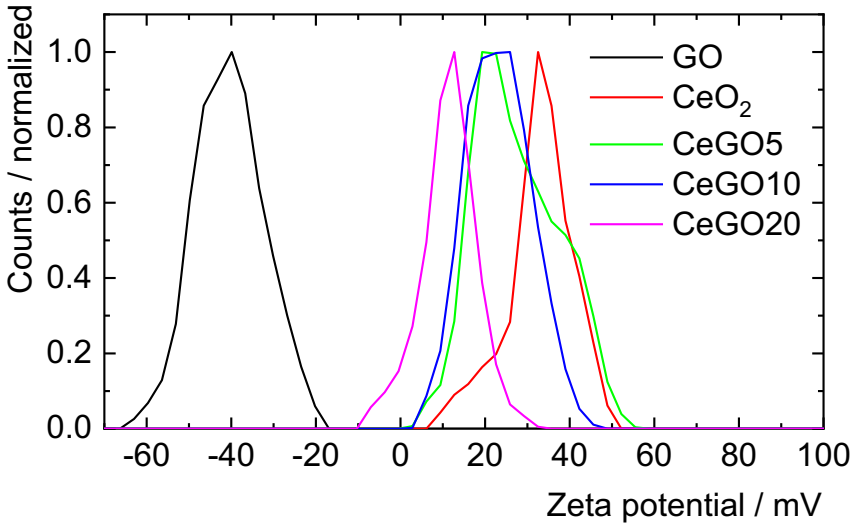

Figure S3. Zeta potential distribution of deionized water (pH~6) dispersions of GO, CeO_2, and CeGO samples as obtained by electrophoretic light scattering.

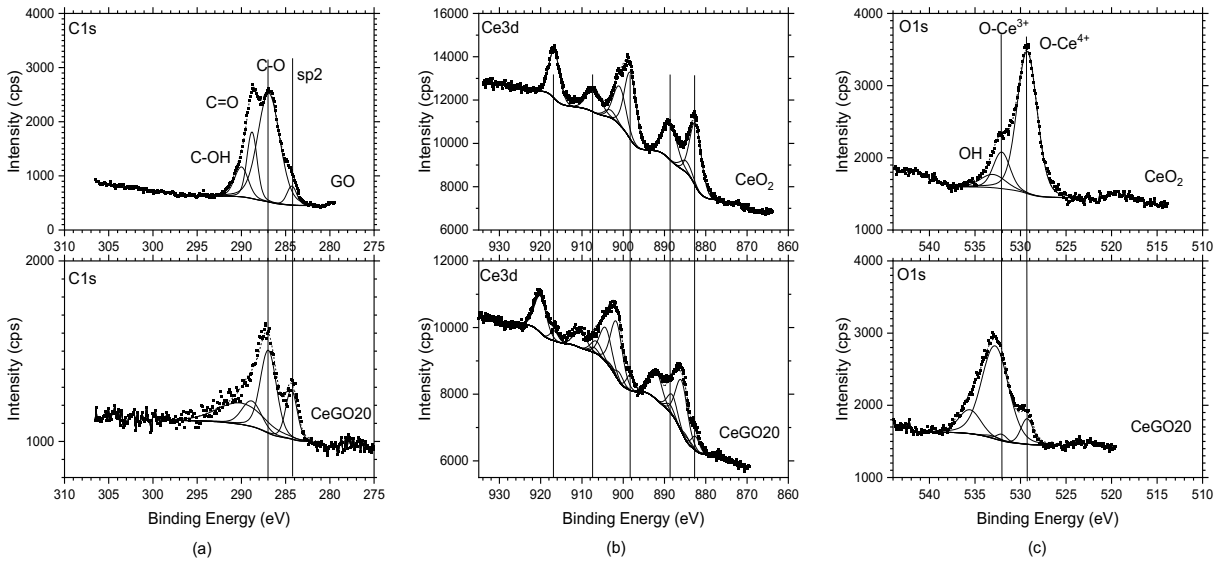

Figure S4. XPS spectra of (a) C1s for GO and CeGO20 samples, (b) Ce3d and (c) O1s for CeO_2 and CeGO20 samples.

Figure S5. HPLC chromatograms of standards of (top to bottom) BPS, PSA, phenol and the selected chromatogram of BPS reactive adsorption on CeGO20 at time 120 min.

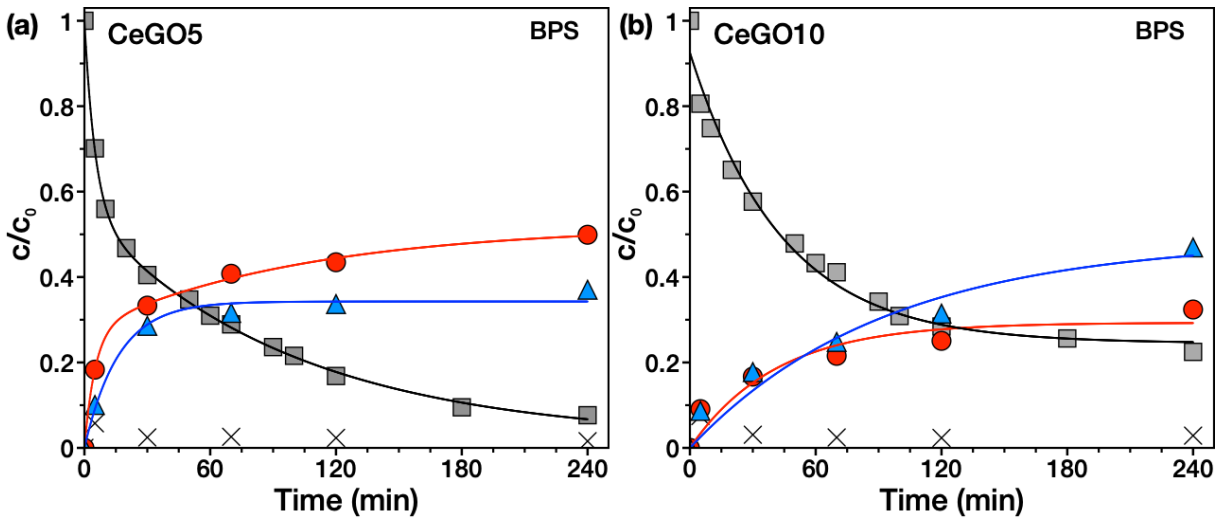

Figure S6. Ceria-catalyzed hydrolysis of BPS on CeGO5 and CeGO10 nanocomposites.

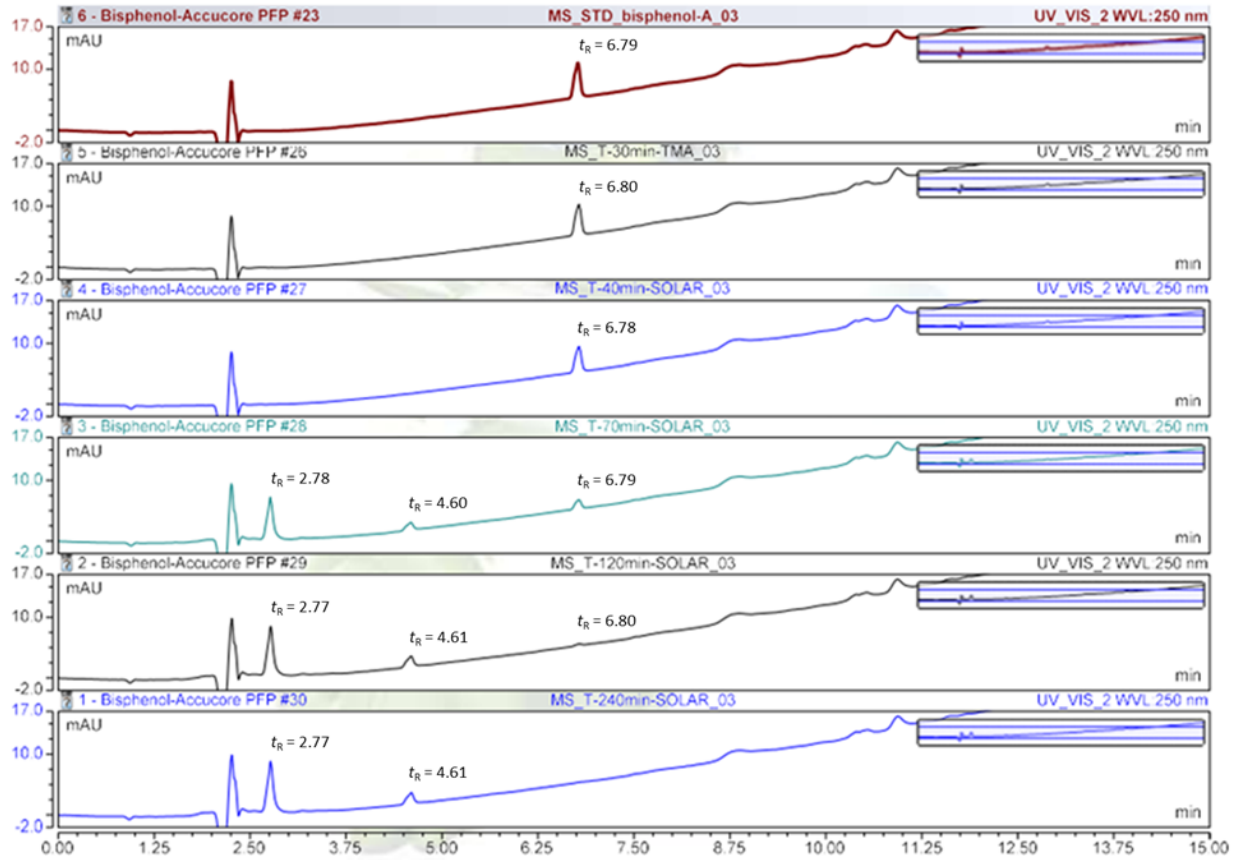

Figure S7. Time-resolved chromatograms of BPA photodegradation on CeGO20 sample.

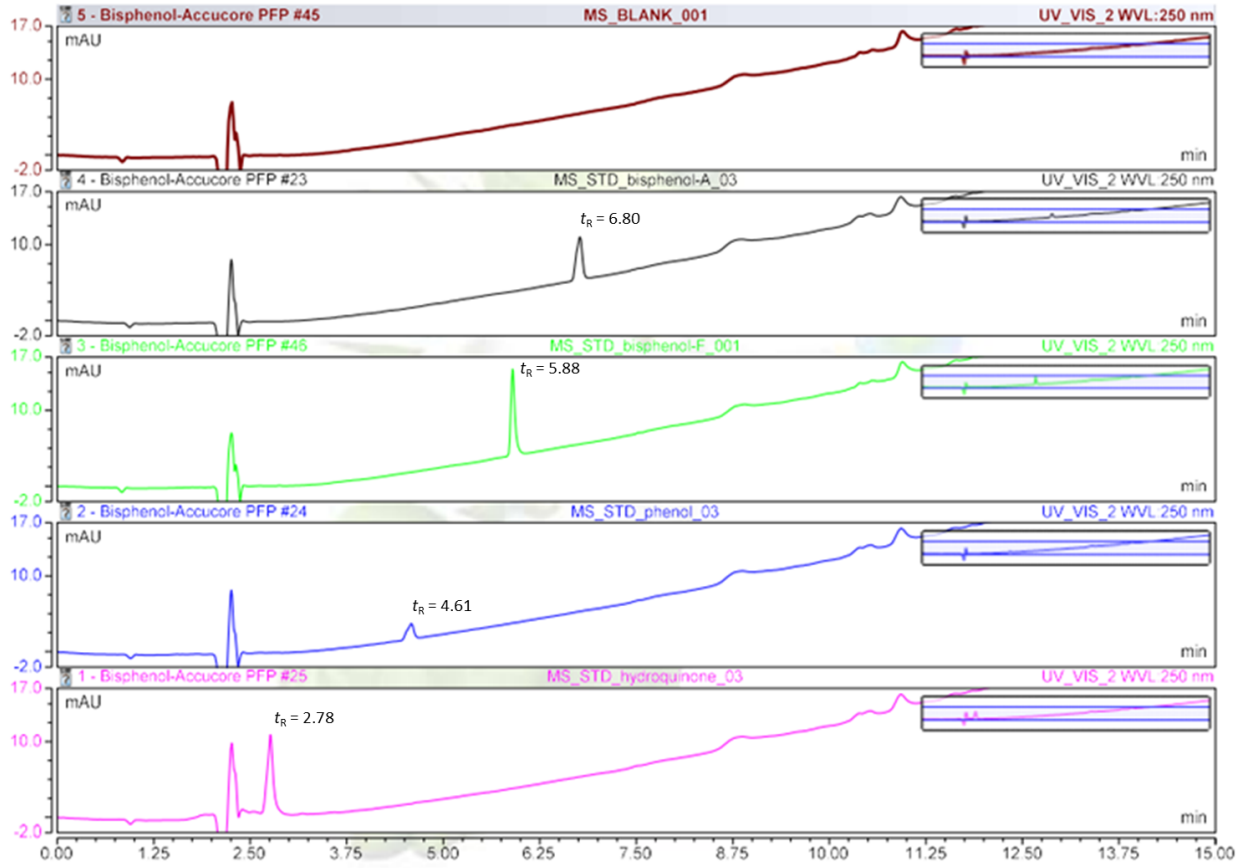

Figure S8. Chromatograms of standards of BPA, BPF, phenol and hydroquinone.

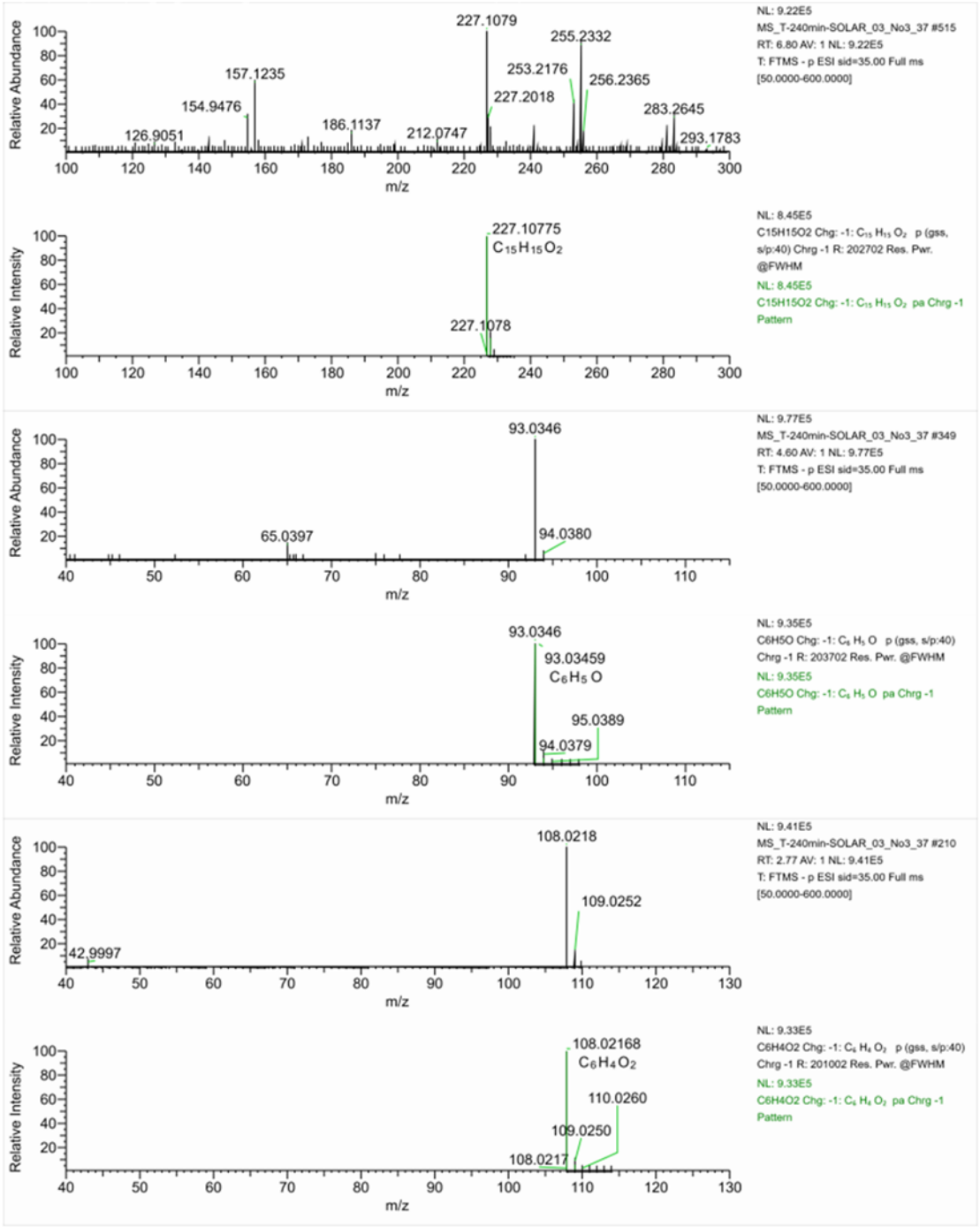

Figure S9. HRMS spectra of the extracted sample CeGO20 after photodegradation of BPA (at time 240 min) showing identified degradation products (hydroquinone – m/z 108.0218, phenol – m/z 93.0347).

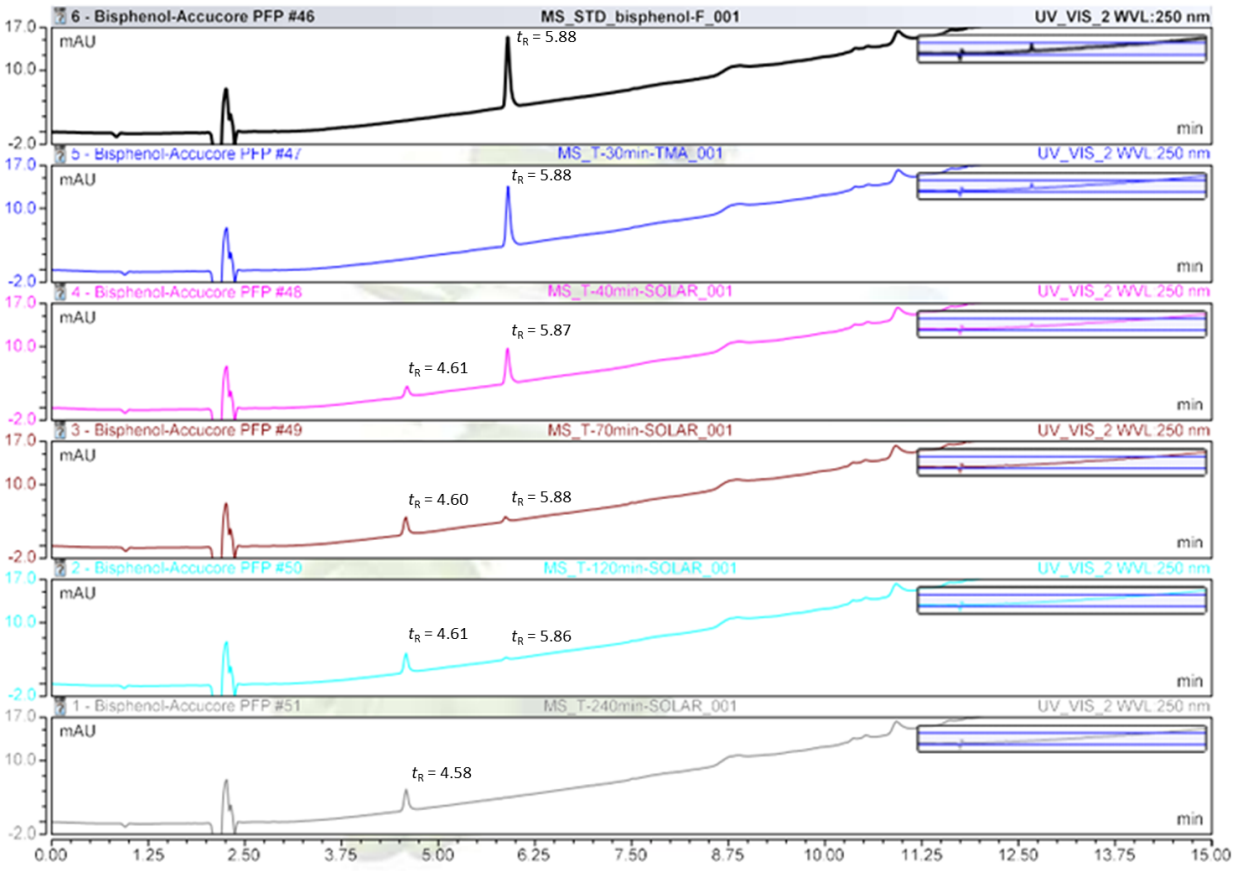

Figure S10. Time-resolved chromatograms of BPF photodegradation on CeGO10 sample.

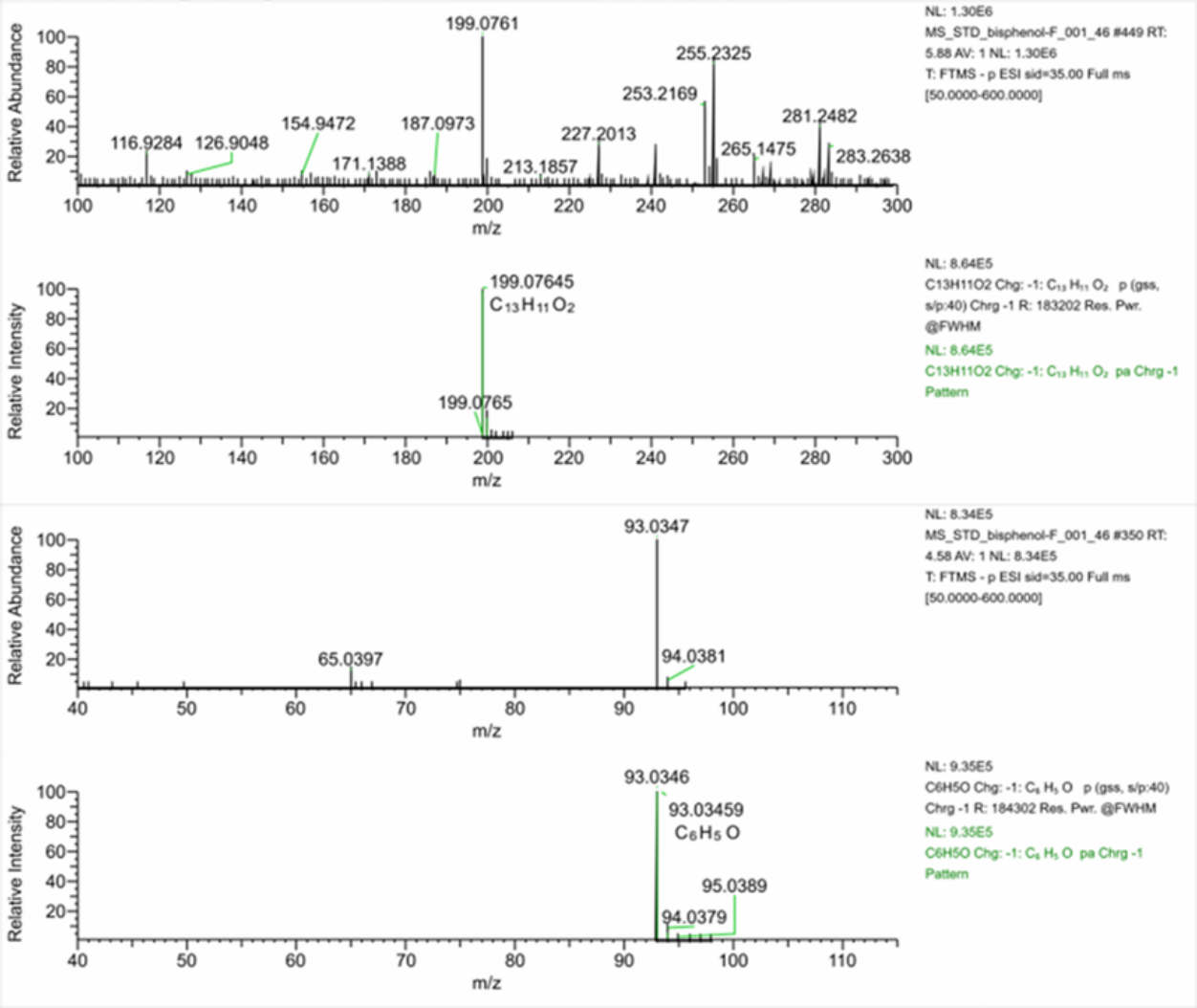

Figure S11. HRMS spectra of the extracted sample CeGO10 after simulated solar light photodegradation of BPF (at time 240 min) showing identified degradation product (phenol – m/z 93.0347).

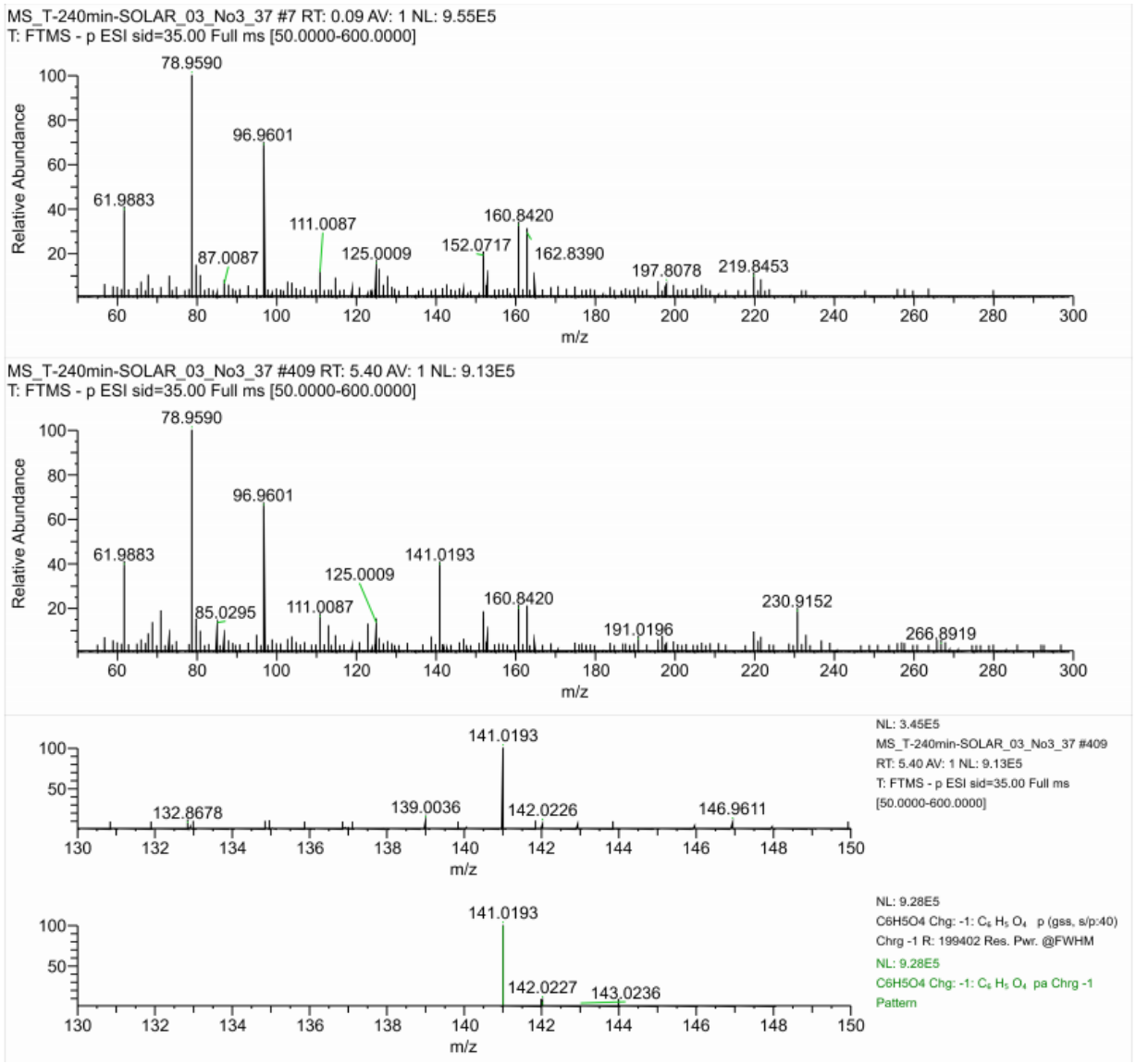

Figure S12. HRMS spectra of the extracted sample CeGO10 after simulated solar light photodegradation of BPF (at time 240 min) showing identified degradation product (hydroxyquinol – m/z 141.0193).

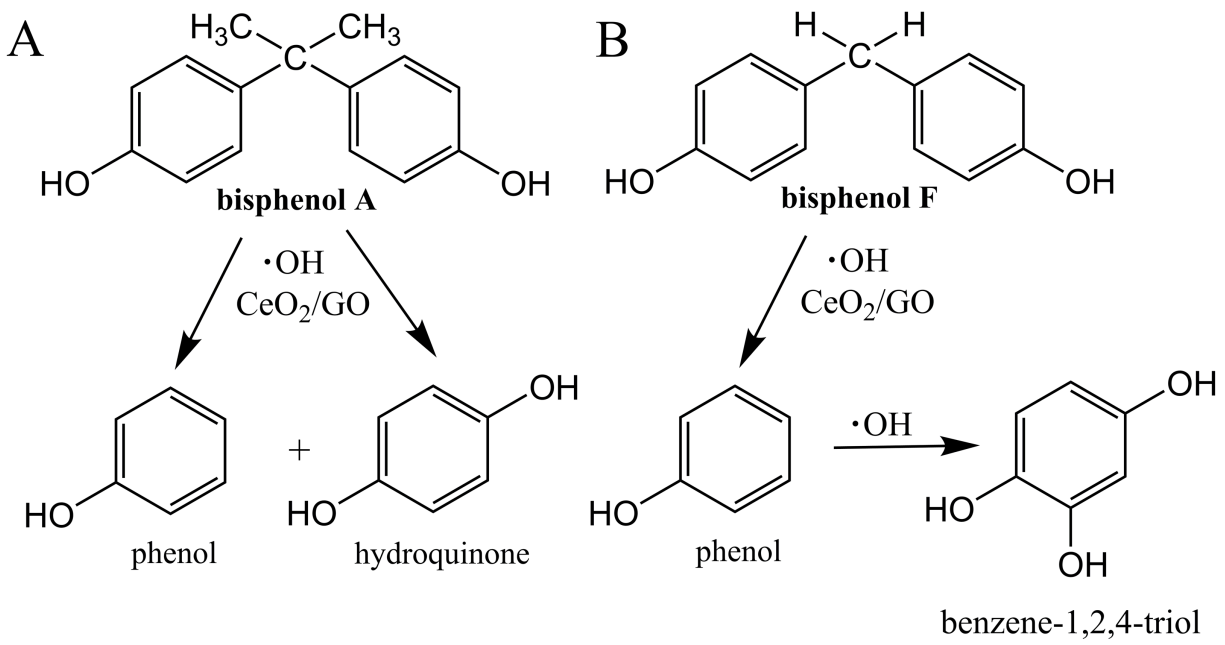

Figure S13. Proposed pathways for the photocatalytic degradation of BPA (A) and BPF (B) on CeGO composites.

XRD measurement details. Diffraction patterns were collected with the PANalytical X´Pert PRO diffractometer equipped with a conventional X-ray tube (CuKα radiation, 40 kV, 30 mA) and a linear position sensitive detector PIXcel with an anti-scatter shield. A programmable divergence slit set to a fixed value of 0.5 deg., the Soller slit of 0.04 rad and a mask of 15 mm were used in the primary beam. A programmable anti-scatter slit set to a fixed value of 0.5 deg., the Soller slit of 0.04 rad and Ni beta-filter were used in the diffracted beam. Data were collected in the range of 15 - 105 deg. 2theta with the step of 0.0131 deg. and 300 s/step producing a scan of about 2 hours 15 minutes. Qualitative analysis was performed with the HighScorePlus software package (Malvern PANalytical, The Netherlands, version 5.2.0) together

with the PDF-5+ database. For the determination of unit cell parameters and the line profile analysis, the Profex 5.3.0/BGMN 4.2.23 code was used. This software package uses the fundamental parameters approach evaluating the crystallite sizes and microstrain. The model of ceria was taken from PDF-5+ database.

HPLC/DAD measurement details. For the analysis, HPLC/DAD system UltiMate 3000, equipped with a Diode Array Detector (DAD) was used. The DAD was set to monitor wavelengths corresponding to the absorption maxima of the individual analytes. DAD detection was carried out at 228 nm for BPA and BPF, at 260 nm for BPS, at 270 nm for the degradation product phenol, and at 230 nm for *p*-phenolsulfonic acid (PSA). The retention times for the respective analytes were as follows: BPA (t_R = 4.38 min), BPS (t_R = 3.76 min), BPF (t_R = 3.90 min), phenol (t_R = 3.57 min), and PSA (t_R = 1.23 min). The chromatographic conditions: Accucore PFP column (2.6 µm, 150 x 4.6 mm *I.D.*) maintained at 30 °C; gradient elution with a mobile phase of ACN/H_2O (0.1% formic acid, HPLC gradient grade, Aldrich), starting from 30/70 (0 min) and linearly increasing to 95/5 (6 min), followed by a 1-minute hold at 95/5, and then returning to 30/70 for equilibration over 1.5 min. The flow rate was set at 1.0 mL/min, with an injection volume of 20 µL for all samples.

Sample extraction procedure. Extraction of BPS and its degradation products, PSA and phenol, was performed at selected time intervals (5, 30, 70, 120, and 240 minutes) to assess the balance of individual analytes, following slight modifications to the protocol described in our previous work (https://doi.org/10.1021/acs.inorgchem.3c04367). The reaction suspension (25 mg/100 mL) after adsorption was divided into four portions (25 mL each) and transferred into

centrifuge tubes. Each portion was centrifuged at 10,000 rpm for 5 minutes. The resulting supernatants were carefully removed, and 2 mL of an extraction solution comprising acetonitrile:water (1:1, v/v) was added to each tube. The mixtures were vortexed, transferred to 2 mL Eppendorf tubes, and centrifuged at 18,000 rpm for 2 minutes. The supernatants were then collected in a 25 mL volumetric flask. This entire procedure was repeated three times, yielding a total of four extracts (8 mL). The volumetric flask was then filled to the mark with water, filtered through a syringe filter (NYL, 0.2 µm), and immediately analyzed by HPLC/DAD or HPLC-HRMS (in the case of BPA and BPF). Blank experiments were conducted in the absence of a catalyst to rule out spontaneous decomposition of BPS in various solvents, as well as adsorption onto glassware, lids, and other surfaces. Additionally, the potential influence of the extraction solvent itself on the degradation of BPS was tested on the prepared materials (data not shown). It was confirmed that no reaction occurred in the acetonitrile:water (1:1) mixture.