ELECTRONIC SUPPORTING INFORMATION

Keggin-type Silicotungstates as efficient catalysts for sustainable oxidations with H_2O_2

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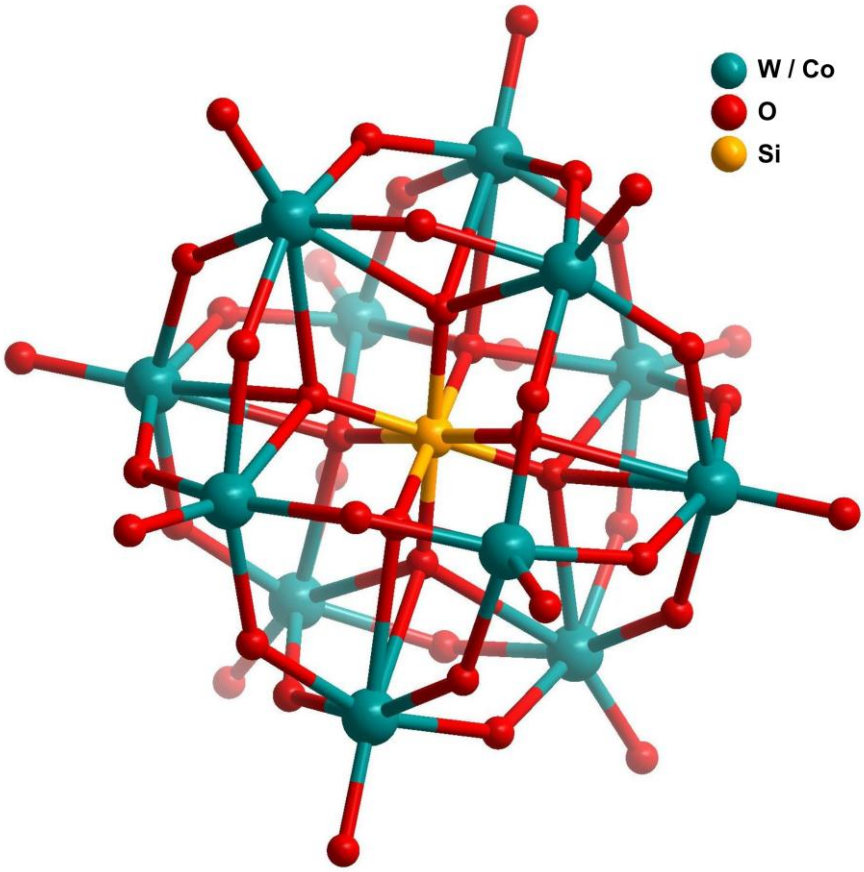

Figure S1. Ball-and-Stick representation of the polyoxoanion $[SiW_{11}Co(H_2O)O_{39}]^{6-}$ present in the compound $K_4H_2[SiW_{11}CoH_2O_{40}]\cdot 22H_2O$, $KSiW_{11}Co$.

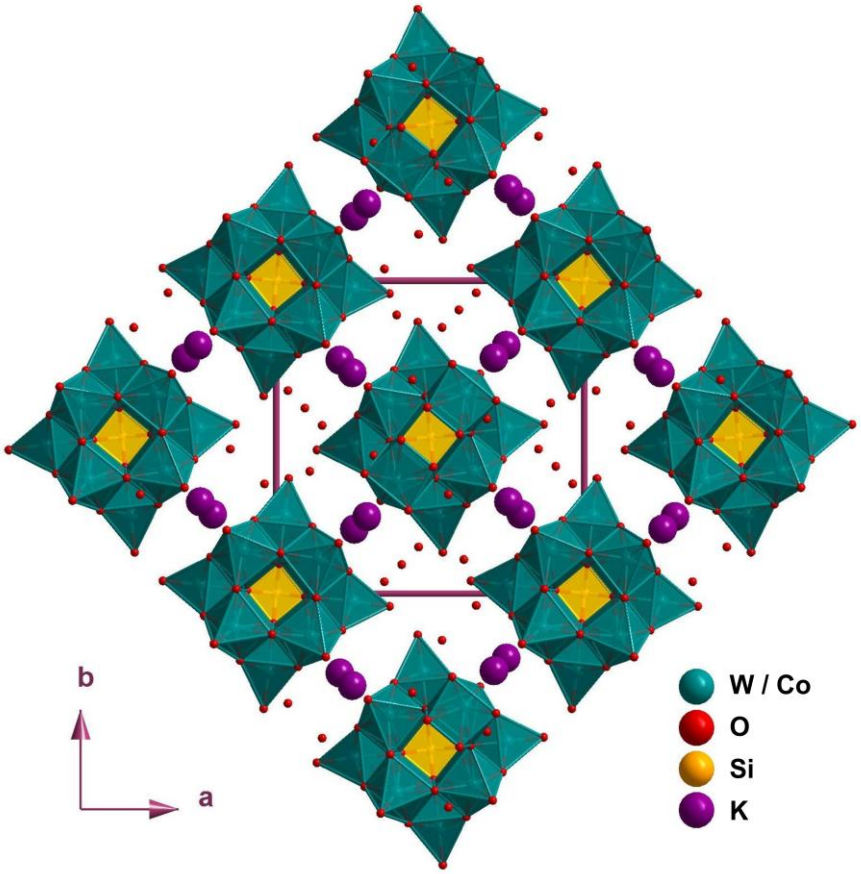

Figure S2. Crystalline packing of compound $K_4H_2[SiW_{11}CoH_2O_{40}]\cdot 22H_2O$, ($KSiW_{11}Co$) viewed along the [001] direction of the unit cell.

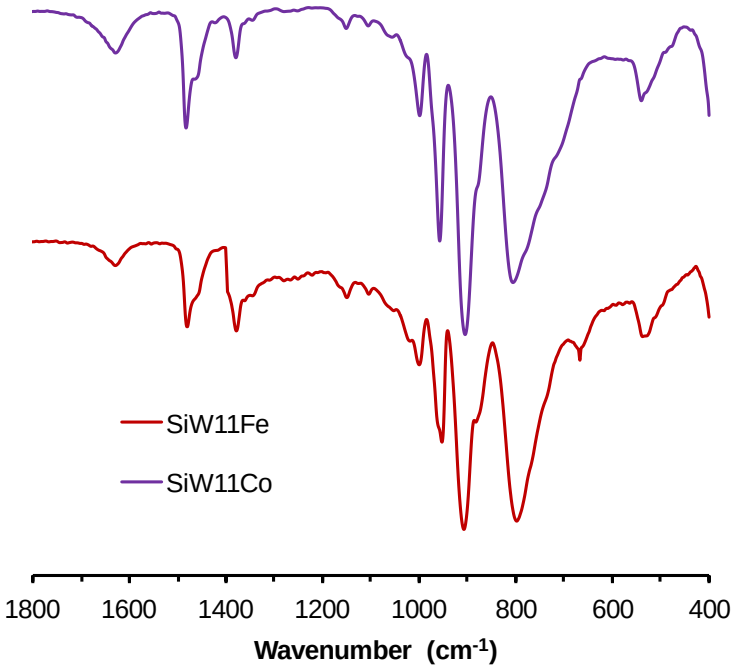

Figure S3. FT-IR spectra of the TBA salts of mono-substituted silicotungstates.

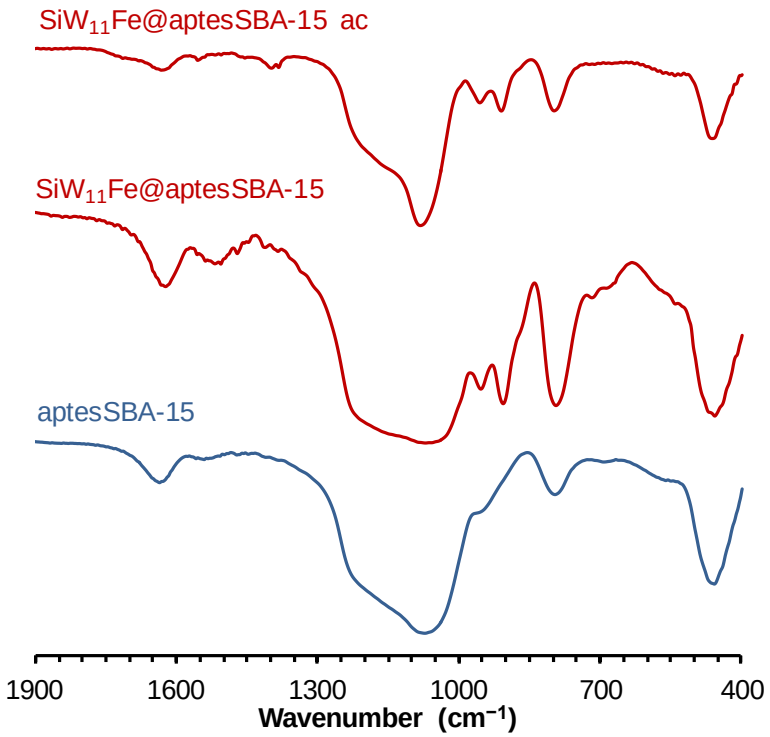

Figure S4. FT-IR spectra of support aptesSBA-15 and $SiW_{11}Fe$@aptesSBA-15 composites before and after catalytic use in the wavenumber region between 400 and 1900 cm^{-1}. Name of sample with ac corresponds to recovered sample after catalyze the styrene oxidation reaction.

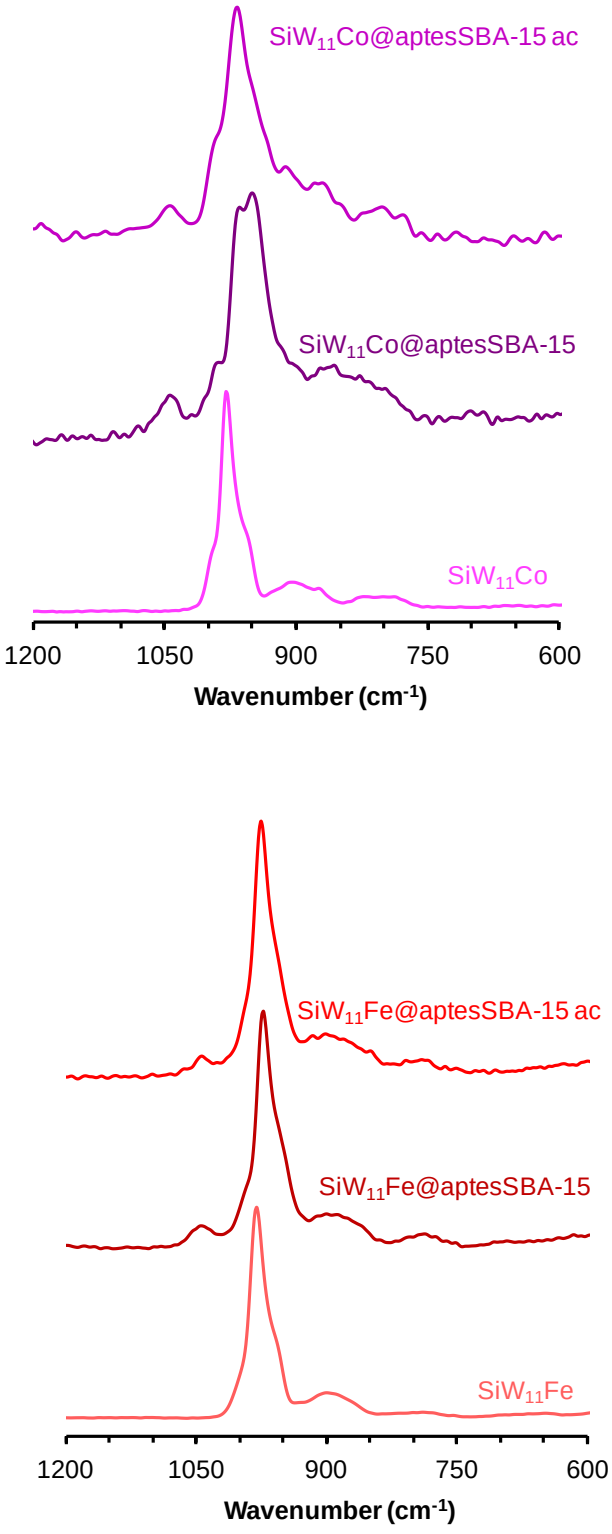

Figure S5. FT-Raman spectra of the TBA salt of silicotungstates and their composites before and after catalytic use in the wavenumber region between 600 and 1200 cm^{-1}. Name of samples with ac corresponds to recovered samples after catalyze the styrene oxidation reaction.

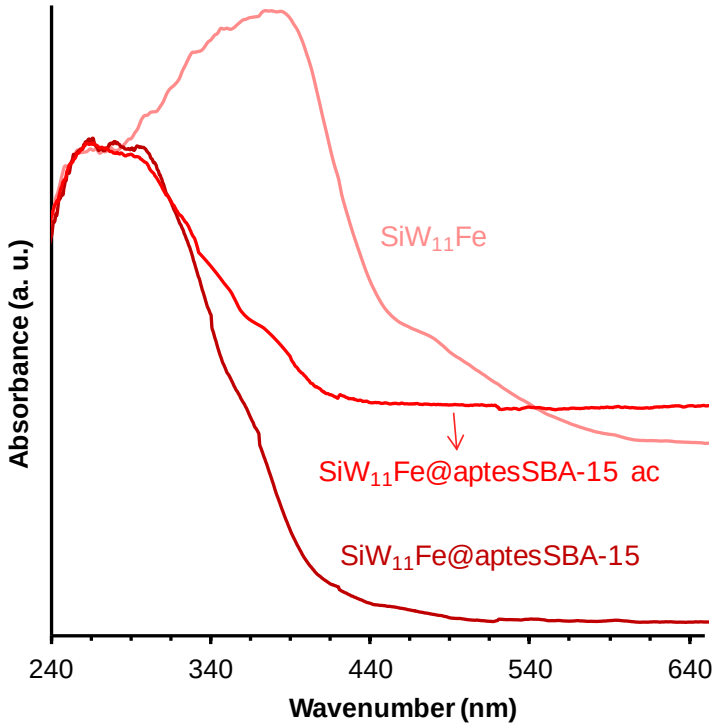

Figure S6. Diffuse reflectance spectra of mono-substituted $SiW_{11}Fe$ and its composite before and after catalytic use (ac) in the wavenumber region between 640 and 240 cm^{-1}. Name of sample with ac corresponds to recovered sample after catalyze the styrene oxidation reaction.

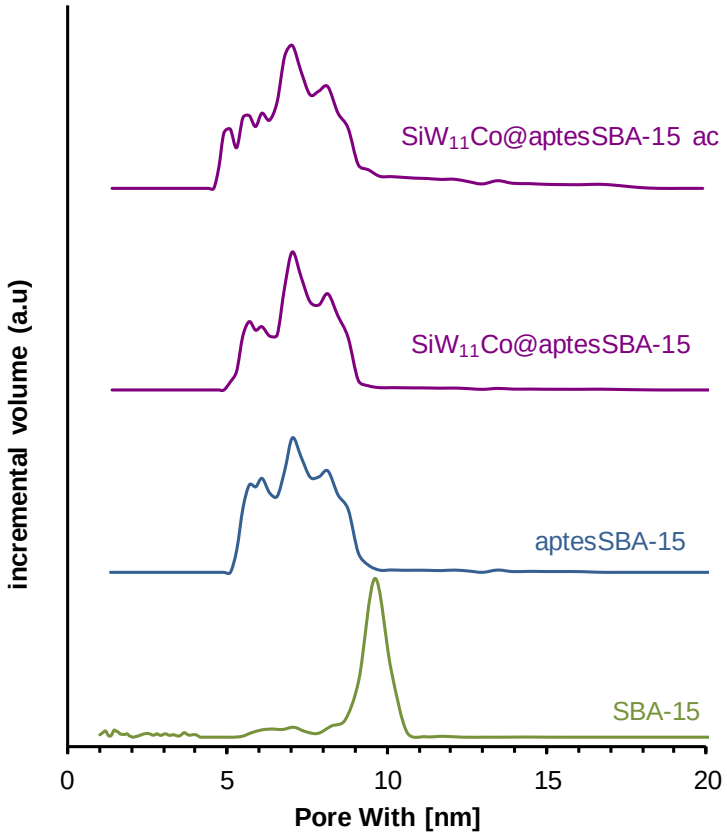

Figure S7. Nitrogen adsorption-desorption isotherms at -196 ºC for the initial and modified SBA-15 samples. Name of sample with ac corresponds to recovered sample after catalyze the styrene oxidation reaction.

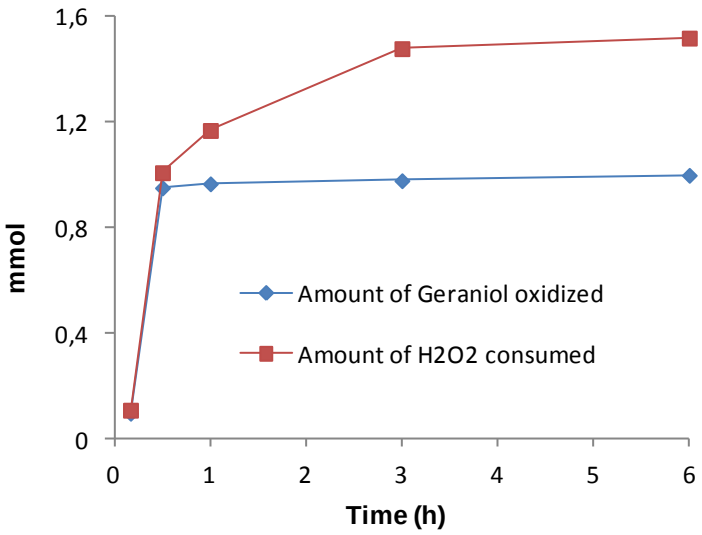

Figure S8. Comparison between the amount of geraniol oxidized and the amount of oxidant H_2O_2 consumed in the reaction catalyzed by the homogeneous $SiW_{11}Co$ and using acetonitrile as solvent.

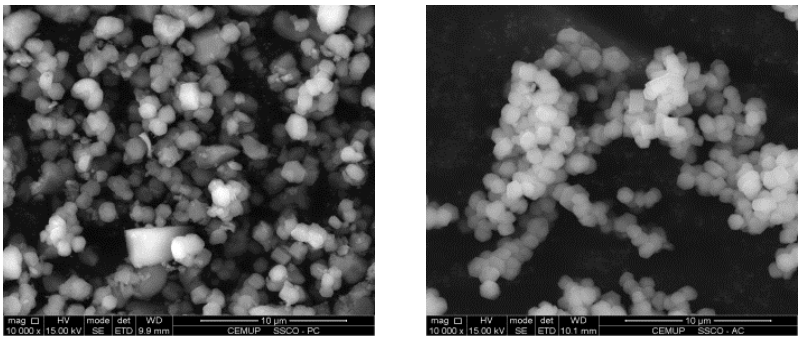

Figure S9. Scanning Electronic Microscopy images of $SiW_{11}Co$@aptesSBA-15 before (left) and after (right) to be used as catalyst in the oxidation of styrene with H_2O_2.