Supplementary Materials

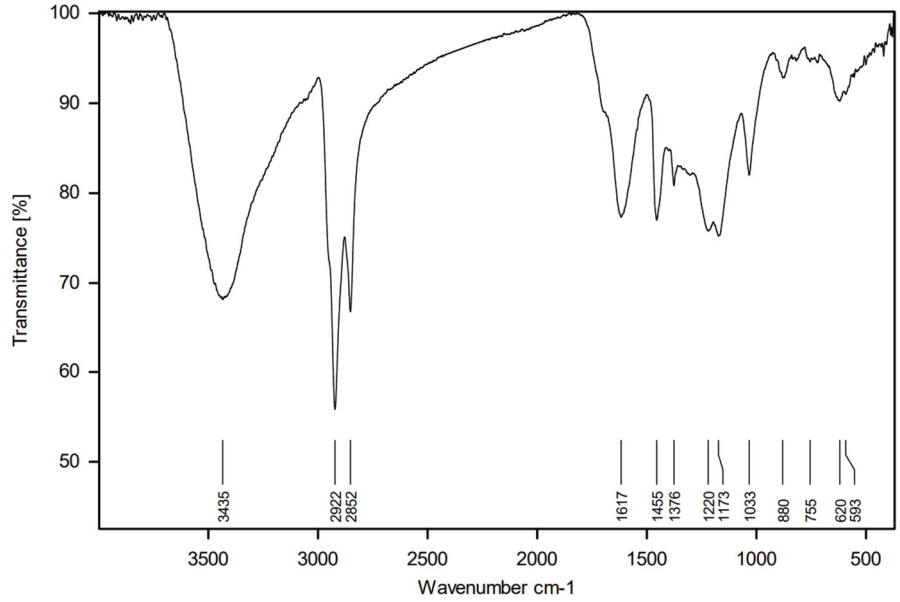


Figure S1. IR spectrum of products of oxidation of petroleum asphaltenes with $(NH_4)_2S_2O_8/H_2SO_4$ [32]

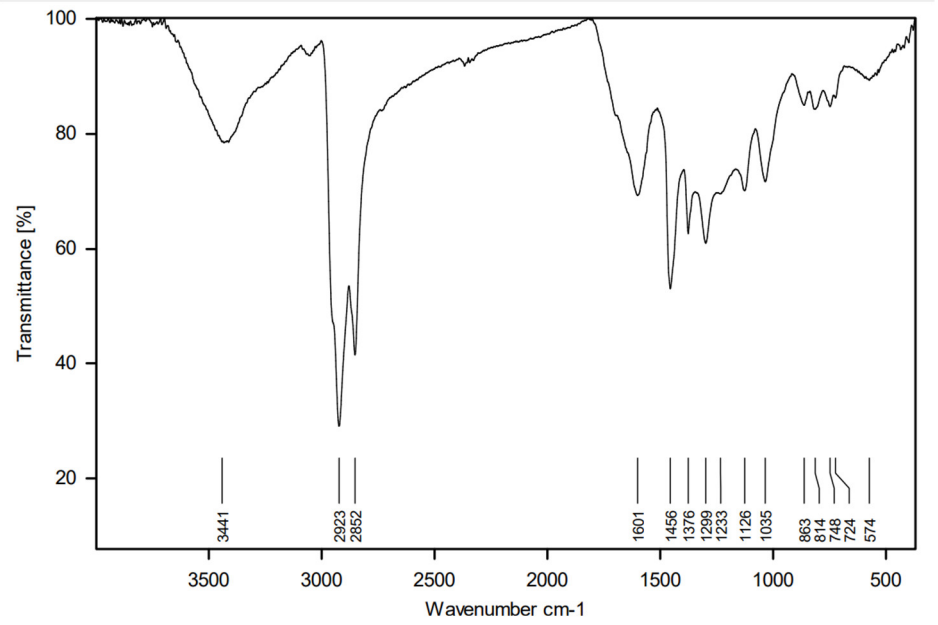


Figure S2. IR spectrum of products of oxidation of petroleum asphaltenes with CH_3COOH/H_2O_2 [34]

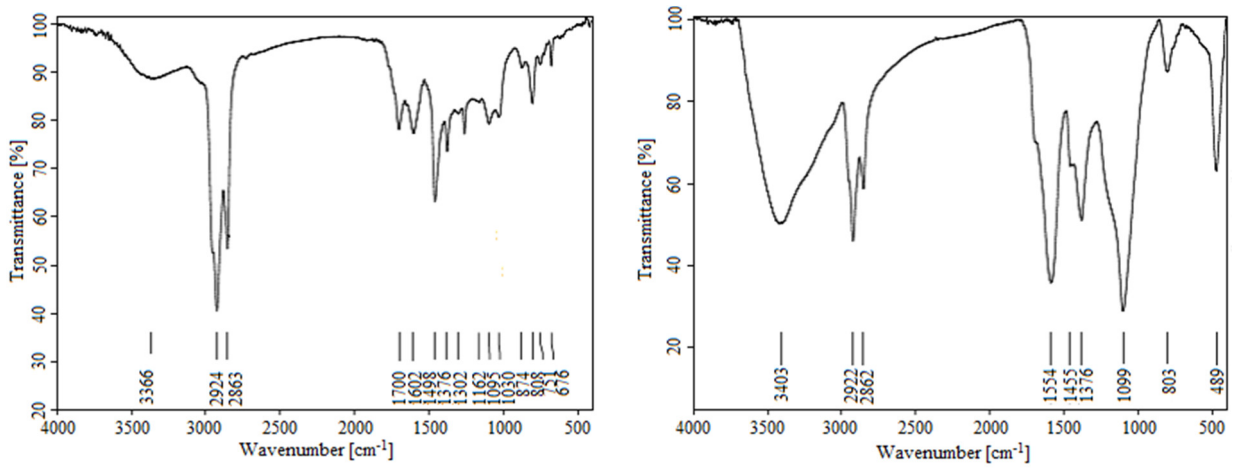


Figure S3. IR spectra of SP-1 (left) and SP-2 (right) products obtained by oxidation of petroleum asphaltenes with sodium percarbonate [40].

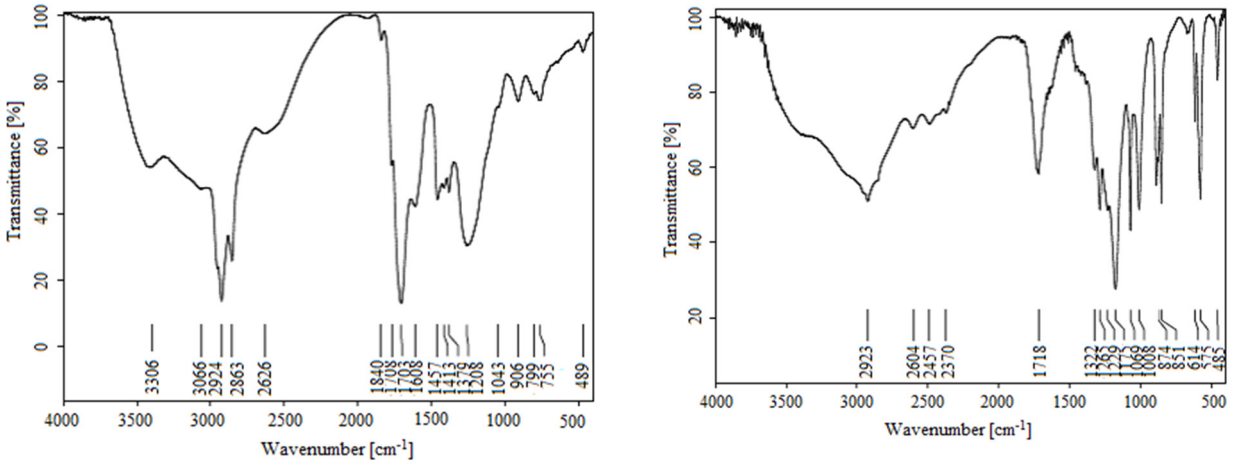
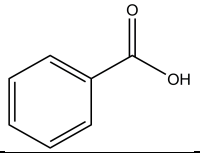
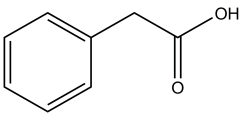
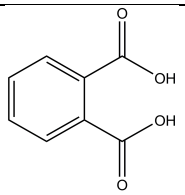
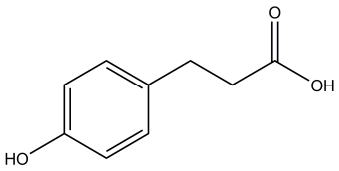
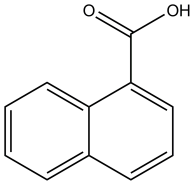
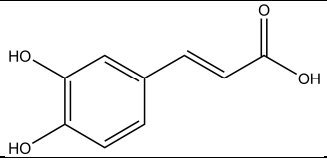
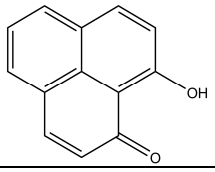
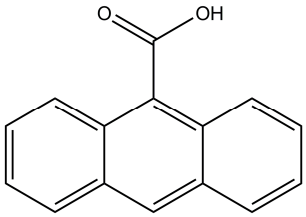
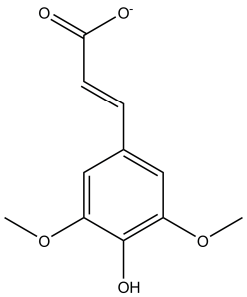
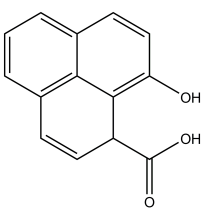
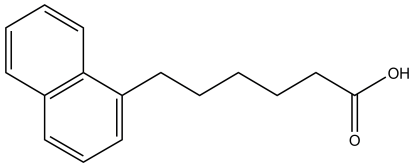
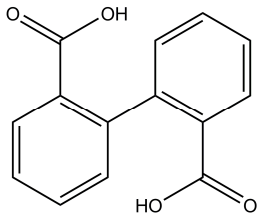
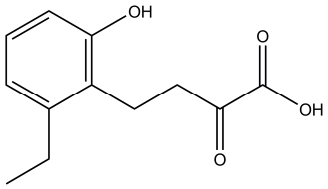
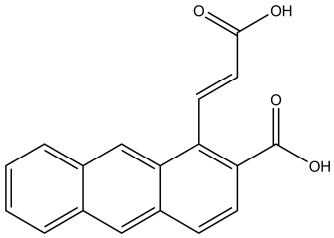
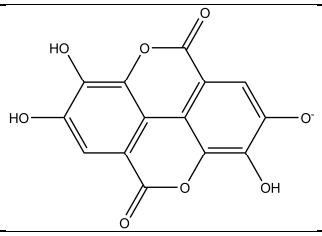
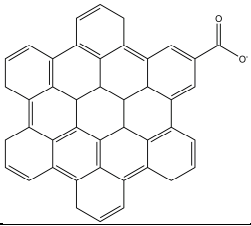
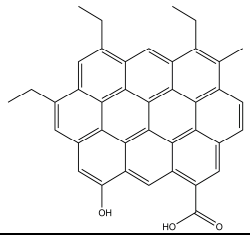


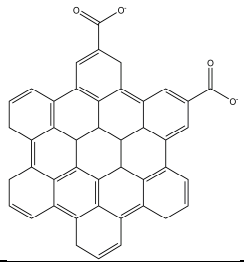
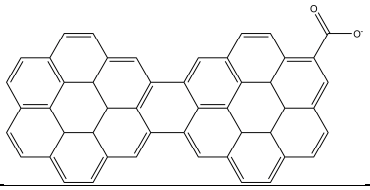
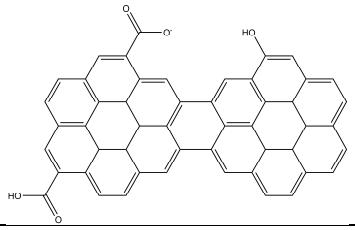
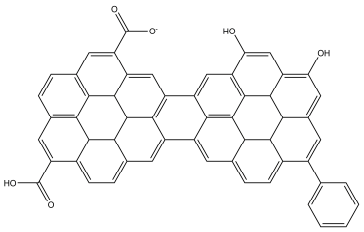
Figure S4. IR spectra of SP-3 (left) and SP-4 (right) products obtained by oxidation of petroleum asphaltenes with sodium percarbonate [40].

Table S1. Ion analysis results according to ESI-MS data (-) for SP-3 and SP-4 products

№	compound	structure	MS diagnostic ion
1	Benzoic acid		121(M^-), 77 (M^- - CO_2)
2	Phenylacetic acid		135 (M^-)

3	Phthalic acid		165 (M^-), 149 ($C_8H_5O_3$), 121 ($M^- - CO_2$)
4	3-(4-Hydroxyphenyl)propionic acid		165 (M^-)
5	1-naphthoic acid		171 (M^-), 153 ($M^- - H_2O$), 127 ($M^- - CO_2$)
6	Caffeic acid		179 (M^-), 135 ($M^- - CO_2$)
7	9-hydroxyphenalen-1-one		195 (M^-)
8	Anthracene-9-carboxylic acid		221 (M^-)
9	Sinapic acid		223 (M^-)
10	9-oxophenalene-1-carboxylic acid		223 (M^-), 205 ($M^- – H_2O$), 195 ($M^- – CO$) 179 ($M^- – CO_2$)

11	6-(1-naphthyl) hexanoic acid		241 (M^-), 223 ($M^- - H_2O$), 205 ($M^- - H_2O$), 197 ($M^- - CO_2$), 195 ($C_{10}H_7(CH_2)_3CH{=}CH^-$)
12	Diphenic acid		241 (M^-, 5), 197 ($M^- - CO_2$, 1), 179 ($M^- - CO_2 - H_2O$)
13	4-[2-ethyl-6-hydroxyphenyl]-2-oxobutanoic acid		221 (M^-), 177 ($M^- - CO_2$), 149 ($M^- - CO_2 - CO$), 121 ($M^- - CO_2 - 2CO$)
14	1-(2-)[3-Hydroxy-3-oxo-prop-1-enyl]anthracene-2-(1-)-carboxylic acid		291 (M^-), 273 ($M^- - H_2O$), 247 ($M^- - CO_2$), 221 ($M^- - CO_2 - C_2H_2$), 203 ($M^- - 2CO_2$), 177 ($M^- - 2CO_2 - C_2H_2$)
15	Ellagic acid		301 (M^-)
16	Hexabenzocoronenic acid		565 (M^-)
17	Triethylmethylhydroxy ovalic acid		583 (M^-)

18	Hexabenzocoronene diacid		608 (M^{2-})
19	Dicoronenic acid		639 (M^{-})
20	Hydroxydicoronedic diacid		701 (M^{-})
21	Dihydroxyphenyldicoronenic diacid		793 (M^{-})