Electronic Supplementary Material (ESI) for Reaction Chemistry & Engineering. This journal is © The Royal Society of Chemistry 2023

## 1 Supplement

## 2 Synthesis of Fe<sub>3</sub>O<sub>4</sub> particles

Magnetic Fe<sub>3</sub>O<sub>4</sub> particles have been prepared by the improvement of previous

4 methods. FeCl<sub>3</sub>•6H<sub>2</sub>O (6.8 g), trisodium citrate dihydrate (2.0 g) and sodium acetate

5 (12.0 g) were dissolved in 50 mL ethylene glycol and placed in a 500 mL beaker. After

6 ultrasonic dissolution, the mixture was transferred to a Teflon-lined stainless steel and

kept in an oven at 200 °C for 8 h. When the reaction was complete, the product was

8 washed several times with ethanol and ultrapure water and dried under vacuum at 60

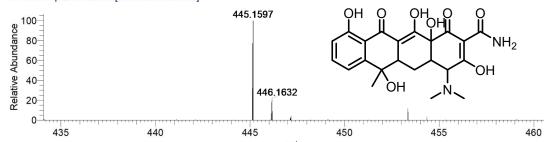
9 °C.

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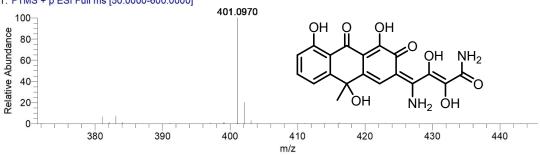
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## 11 Mass spectra

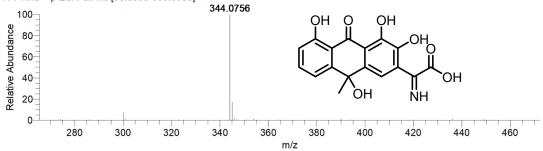
sample-A #4898 RT: 9.15 AV: 1 SB: 2 9.09 , 9.29 NL: 2.38E6 T: FTMS + p ESI Full ms [50.0000-600.0000]



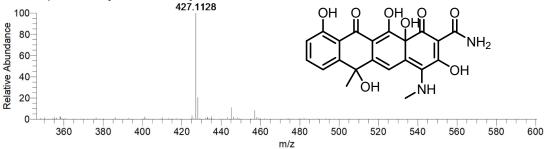
sample-A #5788 RT: 10.73 AV: 1 SB: 2 10.65 , 11.41 NL: 1.45E7 T: FTMS + p ESI Full ms [50.0000-600.0000]



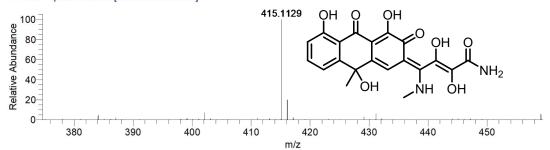
sample-A #4094 RT: 7.62 AV: 1 SB: 2.7.50, 7.96 NL: 3.74E7 T: FTMS + p ESI Full ms [50.0000-600.0000]



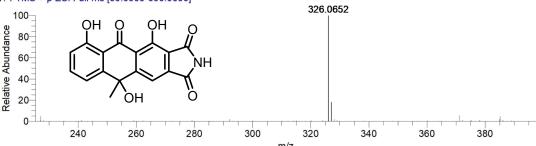
14 sample-A #5255 RT: 9.78 AV: 1 SB: 2 9.63 , 9.98 NL: 8.17E6 T: FTMS + p ESI Full ms [50.0000-600.0000]



15 sample-A #5145 RT: 9.59 AV: 1 SB: 2 9.46 , 9.73 NL: 3.71E6 T: FTMS + p ESI Full ms [50.0000-600.0000]

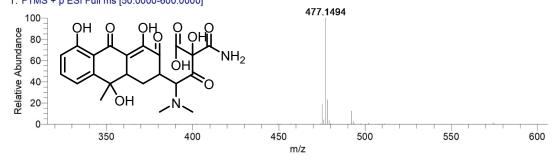


sample-A #5008 RT: 9.34 AV: 1 SB: 2 9.19 , 9.69 NL: 2.11E7 T: FTMS + p ESI Full ms [50.0000-600.0000]



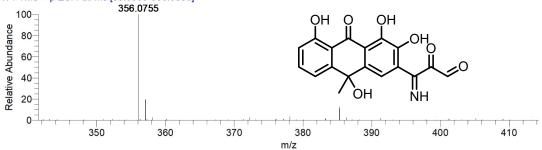
17 sample-A #2971 RT: 5.45 AV: 1 SB: 2 5.32 , 5.81 NL: 3.96E6 T: FTMS + p ESI Full ms [50.0000-600.0000]

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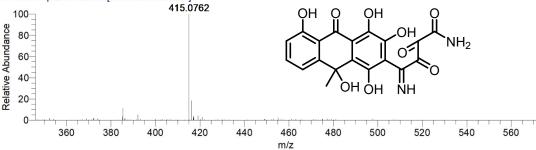


sample-A #4455 RT: 8.31 AV: 1 SB: 2 8.14 , 8.49 NL: 8.52E5 T: FTMS + p ESI Full ms [50.0000-600.0000] 433.1234 100-Relative Abundance 80 60 40 но́  $\dot{N}H_2$ 20-600 350 400 450 500 550 m/z 19 sample-A #4510 RT: 8.42 AV: 1 SB: 2 8.31 , 8.57 NL: 7.35E5 T: FTMS + p ESI Full ms [50.0000-600.0000] 477.1129 100-Relative Abundance 80 60 40-459.1025 ŅΗ 20-0-440 430 460 420 450 470 480 490 m/z 20 sample-A #4702 RT: 8.79 AV: 1 SB: 2 8.68 , 9.21 NL: 2.16E6 T: FTMS + p ESI Full ms [50.0000-600.0000] 461.1548 100-Relative Abundance 80 60 403.1493 ОН 40нó 433.1236 20-0 600 350 500 550 300 400 450 m/z 21 sample-A #4788 RT: 8.95 AV: 1 SB: 1 9.19 NL: 7.75E5 T: FTMS + p ESI Full ms [50.0000-600.0000] 447.1388 100 Relative Abundance 80-60 OH 40-399.0816 / НÓ 433.1230 20-0 390 400 410 440 460 380 420 430 450 m/z 22 sample-A #4909 RT: 9.17 AV: 1 SB: 1 9.29 NL: 1.23E7 T: FTMS + p ESI Full ms [50.0000-600.0000] 431.1077 100-Relative Abundance 80  $\mathsf{NH}_2$ Òŀ 60 40-HΟ  $\dot{N}H_2$ 20-0 350 360 370 380 390 400 410 420 430 440 m/z 23

sample-A #4026 RT: 7.50 AV: 1 SB: 2 7.36 , 7.59 NL: 8.95E5 T: FTMS + p ESI Full ms [50.0000-600.0000]

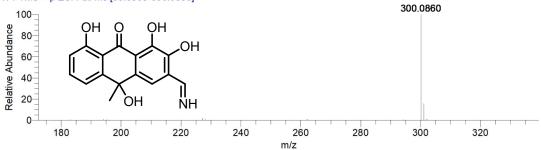


24 sample-A #4352 RT: 8.10 AV: 1 SB: 2 7.36 , 7.59 NL: 2.18E6 T: FTMS + p ESI Full ms [50.0000-600.0000]



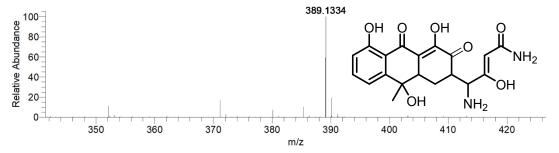
25 sample-A #5442 RT: 10.12 AV: 1 SB: 2 10.04 , 10.21 NL: 4.75E5 T: FTMS + p ESI Full ms [50.0000-600.0000]  $NH_2$ Relative Abundance 80 60 он он  $\dot{N}H_2$ 40 428.1329 418.0956 439.1133 20-0 435 450 405 410 415 420 430 440 445

26 sample-A #4576 RT: 8.55 AV: 1 SB: 2 8.44 , 8.72 NL: 6.37E6 T: FTMS + p ESI Full ms [50.0000-600.0000]

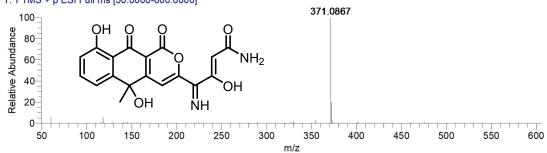


27 sample-A #4585 RT: 8.57 AV: 1 SB: 2 8.48 , 8.82 NL: 1.90E6 T: FTMS + p ESI Full ms [50.0000-600.0000]

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sample-A #5107 RT: 9.52 AV: 1 SB: 2 8.48 , 8.82 NL: 5.93E7 T: FTMS + p ESI Full ms [50.0000-600.0000]

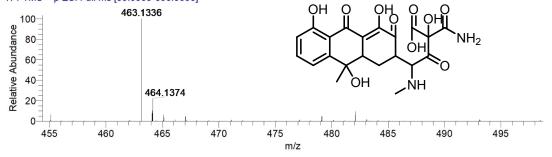


sample-A #3771 RT: 7.01 AV: 1 SB: 1 6.80 NL: 8.41E5 T: FTMS + p ESI Full ms [50.0000-600.0000]

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sample-A #4716 RT: 8.82 AV: 1 SB: 2 8.74 , 8.95 NL: 2.72E5 T: FTMS + p ESI Full ms [50.0000-600.0000]

