Supporting Information

Fluorescent Nanoparticles from Mature Vinegar: Their Properties and Interaction with Dopamine

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Experimental section

Stability study of the FNs

Effect of pH on fluorescence intensity of the FNs. Different amounts of 0.2 mol L\(^{-1}\) NaOH solution were added to the Britton–Robinson buffer consisting of 0.04 M H\(_3\)BO\(_3\), 0.04 M H\(_3\)PO\(_4\) and 0.04 M CH\(_3\)COOH to prepare various pH (pH 2–11) solutions. 200 μL of FNs solution (3.5 mg mL\(^{-1}\)) was added to 2 mL of pH-adjusted Britton–Robinson buffer and the fluorescence intensity at excitation wavelength of 320 nm was recorded for each of the samples, and triplicate measurements on each sample were averaged to yield the recorded value for the sample.

Effect of Ionic strength on fluorescence intensity of the FNs. In this work, sodium ions solutions of different concentrations (5.0, 4.5, 4.0, 3.5, 3.0, 2.5, 2.0, 1.5, 1.0, 0.5 mol L\(^{-1}\)) were prepared with sodium chloride (NaCl) to study the effect of ionic strength on the fluorescent property of the FNs. 200 μL of FNs solution (3.5 mg mL\(^{-1}\)) was added to 1.8 mL of each of the NaCl solution samples to prepare a set of 2 mL of FN-NaCl solutions with various NaCl concentrations. A blank control is prepared with 200 μL of FNs solution added into 1.8 mL of pure water. The fluorescence intensity of each of the samples was recorded at the excitation wavelength of 320 nm, and triplicate measurements on each sample were averaged to yield the recorded value for the sample.

Effects of Metal ions on fluorescence intensity of the FNs. 200 μL FNs solution (5 mg mL\(^{-1}\)) was added to solutions of different metal ions (MnSO\(_4\)·H\(_2\)O, CaCl\(_2\)·2H\(_2\)O, CuCl\(_2\)·2H\(_2\)O, FeCl\(_2\)·4H\(_2\)O, MgCl\(_2\)·6H\(_2\)O, FeCl\(_3\)·6H\(_2\)O, NiCl\(_2\)·6H\(_2\)O, Co(NO\(_3\))_2·6H\(_2\)O...
and ZnSO$_4$·7H$_2$O, all at the concentration of 1 mmol L$^{-1}$) to a final volume of 2 mL, respectively. The FNs solution without metal ions was used as the blank control. The fluorescence intensity of each of the samples was recorded using 320 nm wavelength as excitation, and triplicate measurements on each sample were averaged to yield the recorded value for the sample.

**Effect of irradiation time on fluorescence intensity of the FNs.** 2 mL of FNs aqueous solution (1.75 mg mL$^{-1}$) was irradiated at 10, 20, 30, 40, 50, 60, 70, 80 min, respectively, by an UV lamp at 365 nm. Fluorescence intensity after irradiation was recorded with 320 nm wavelength as excitation. The fluorescence intensity at 0 min irradiation was treated as an initial control. Triplicate measurements on each sample were averaged to yield the recorded value for the sample.
Figure S1 (a) The fluorescence responses of FNs towards different pH. (b) The fluorescence responses of FNs towards different NaCl concentration. (c) The fluorescence responses of FNs towards different irradiation time. (d) The fluorescence responses of FNs towards different metal ions.

Figure S2 Fluorescence intensity of FNs (3.75 mg mL\(^{-1}\)) with the addition of different concentration of dopamine. \(\lambda_{\text{ex}}=330\) nm, \(\lambda_{\text{em}}=407\) nm.
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**Table S1** Quantum yield results of FNs, PDA-FCs and FNs-FCs samples.

<table>
<thead>
<tr>
<th>Sample</th>
<th>R²</th>
<th>QY</th>
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<tbody>
<tr>
<td>FNs</td>
<td>0.994</td>
<td>5.71%</td>
</tr>
<tr>
<td>PDA-FCs</td>
<td>0.997</td>
<td>0.59%</td>
</tr>
<tr>
<td>FNs-FCs-0.5</td>
<td>0.995</td>
<td>1.61%</td>
</tr>
<tr>
<td>FNs-FCs-1</td>
<td>0.993</td>
<td>1.05%</td>
</tr>
<tr>
<td>FNs-FCs-2</td>
<td>0.999</td>
<td>0.94%</td>
</tr>
<tr>
<td>FNs-FCs-4</td>
<td>0.992</td>
<td>0.36%</td>
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</tbody>
</table>

**Table S2** XPS survey analysis results of FNs, PDA-FCs and FNs-FCs-4 samples.

<table>
<thead>
<tr>
<th>Sample</th>
<th>C(%)</th>
<th>O(%)</th>
<th>N(%)</th>
<th>O/C(%)</th>
<th>N/C(%)</th>
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</thead>
<tbody>
<tr>
<td>FNs</td>
<td>63.99</td>
<td>33.97</td>
<td>2.03</td>
<td>53.09</td>
<td>3.17</td>
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<tr>
<td>PDA-FCs</td>
<td>74.53</td>
<td>20.46</td>
<td>4.68</td>
<td>27.45</td>
<td>6.28</td>
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<td>FNs-FCs-4</td>
<td>71.80</td>
<td>24.76</td>
<td>3.16</td>
<td>34.48</td>
<td>4.40</td>
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**Table S3** Fluorescence lifetime fitting parameters of FNs, FNs-FCs and PDA-FCs samples.

<table>
<thead>
<tr>
<th>Sample</th>
<th>χ²</th>
<th>τ₁(ns)</th>
<th>τ₂(ns)</th>
<th>A₁ (%)</th>
<th>A₂ (%)</th>
<th>τ(ns)</th>
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<tbody>
<tr>
<td>FNs</td>
<td>0.993</td>
<td>1.23</td>
<td>7.93</td>
<td>24.34</td>
<td>75.66</td>
<td>6.30</td>
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<tr>
<td>FNs-FCs-0.5</td>
<td>1.259</td>
<td>1.58</td>
<td>9.20</td>
<td>49.93</td>
<td>50.07</td>
<td>5.40</td>
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<tr>
<td>FNs-FCs-1</td>
<td>1.179</td>
<td>1.36</td>
<td>7.53</td>
<td>42.43</td>
<td>57.57</td>
<td>4.91</td>
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<tr>
<td>FNs-FCs-2</td>
<td>1.281</td>
<td>1.40</td>
<td>8.25</td>
<td>58.63</td>
<td>41.37</td>
<td>4.23</td>
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<tr>
<td>FNs-FCs-4</td>
<td>1.186</td>
<td>1.34</td>
<td>6.20</td>
<td>67.57</td>
<td>32.43</td>
<td>2.92</td>
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<tr>
<td>PDA-FCs</td>
<td>1.074</td>
<td>1.02</td>
<td>4.65</td>
<td>15.82</td>
<td>84.18</td>
<td>4.08</td>
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