Supporting Information

Sustainable one-step strategy towards low
temperature curable superparamagnetic composite
based on smartly designed Iron nanoparticles and
Cardanol Benzoxazine

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Figure S1: Synthesis of C-trisapm

R = C_{15}H_{31}, C_{15}H_{29} (30\%), C_{15}H_{27} (15\%), C_{15}H_{25} (25\%)
Figure S2: $^1$H-NMR spectra of trisapm (a) and C-trisapm (inset shows the $^{13}$C-spectrum of C-trisapm) in CDCl$_3$; (b) FTIR spectrum of C-trisapm
Figure S3: Digital images of suspension of iron nanoparticles (a, c) and their blends in cardanol benzoxazine (b, d) in THF and chloroform (2.5 mg/mL loading of NPs) at room temperature.
**Figure S4:** TGA (a) and DTG (b) traces of TA and ATA at a heating rate of 10 °C/ min. under nitrogen atmosphere.

**Figure S5:** Histograms for grain size distribution in polymer-nanoparticles composites evaluated from the AFM images of 2μm × 2μm scan area.
Figure S6: Normalized transmission IR absorption spectra of C-trisapm blends after curing at 150 °C for 5h.
Figure S7: Relative change in intensity of normalized FTIR spectra in the monomer and its blend with iron NPs (150 °C for 2 h) at (a) 1255 cm\(^{-1}\), (b) 1040 cm\(^{-1}\), and (c) 1109 cm\(^{-1}\) due to C-O-C\(_{\text{asym}}\), C-O-C\(_{\text{sym}}\) and C-N-C stretching frequencies respectively.
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Figure S9: FTIR spectra of C-trisapm showing development of 1360 cm\(^{-1}\) stretch after curing at 150 °C for 2 h (a), 4h (b) and 8 h (c).
Figure S10: Stacked time dependent normalized $^1$H-NMR spectra of a) C-trisapm, b) C-trisapm(Fe)$_0$, c) C-trisapm(Fe)$_{TA}$, d) C-trisapm(Fe)$_{ATA}$ obtained from the reaction mixture at different time intervals at 150 °C. $^1$H-NMR of C-trisapm at a higher temperature 210 °C for 3 h is shown to notice the changes in relative manner. Inset in figures showed a zoom in region from 3.5-4.4 ppm.
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**Table S1:** Molecular weight of soluble fraction in blends present after curing at 150 °C for 2h.

<table>
<thead>
<tr>
<th>C-trisapm(Fe)$_0$</th>
<th>C-trisapm(Fe)$_{TA}$</th>
<th>C-trisapm(Fe)$_{ATA}$</th>
</tr>
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<tbody>
<tr>
<td>$M_w$</td>
<td>$PDI$</td>
<td>$M_w$</td>
</tr>
<tr>
<td>2174</td>
<td>2.7</td>
<td>2747</td>
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</table>

**Table S2:** Magnetic properties of thermally cured C-trisapm blends.

<table>
<thead>
<tr>
<th>Sample</th>
<th>$M_S$ (emu/g)</th>
<th>$M_R$ (emu/g)</th>
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<tr>
<td>(Fe)$_0$</td>
<td>59.05</td>
<td>10</td>
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<tr>
<td>(Fe)$_{TA}$</td>
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<tr>
<td>(Fe)$_{ATA}$</td>
<td>16.06</td>
<td>6.3</td>
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<tr>
<td>C-trisapm(Fe)$_0$</td>
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<td>0.03</td>
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<tr>
<td>C-trisapm(Fe)$_{TA}$</td>
<td>1.81</td>
<td>0.56</td>
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<tr>
<td>C-trisapm(Fe)$_{ATA}$</td>
<td>1.23</td>
<td>0.15</td>
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