Supporting Information

An insight into the optical property of sub nano size glutathione stabilized gold cluster

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Fig. S1 (a)Absorbance, (b) fluorescence at different excitation and (c) TEM of GMSA
<table>
<thead>
<tr>
<th>Name of the cluster</th>
<th>pH</th>
<th>Temperature</th>
<th>Emission @ 450 nm excitation (nm)</th>
<th>( \lambda_{\text{max}} )</th>
<th>( 750/(\lambda_{\text{max}}) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>AuC1</td>
<td>1.5</td>
<td>27(^\circ)</td>
<td>27(^\circ)</td>
<td>750</td>
<td>1.2</td>
</tr>
<tr>
<td>AuC2</td>
<td>1.5</td>
<td>27(^\circ)</td>
<td>70(^\circ)</td>
<td>750</td>
<td>2.5</td>
</tr>
<tr>
<td>AuC3</td>
<td>1.5</td>
<td>0(^\circ)</td>
<td>70(^\circ)</td>
<td>750</td>
<td>50.42</td>
</tr>
<tr>
<td>AuC4</td>
<td>10</td>
<td>27(^\circ)</td>
<td>70(^\circ)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table S1: Comparison of reaction condition on fluorescence property

**Fig.S2** Lower magnification TEM image of AuC1, AuC2 and AuC4. All the scale bars are 50 nm
Fig. S3 Size distribution of the cluster from TEM.

Fig. S4 UV-Visible absorbance spectra of developed nano materials
Fig. S5 XPS spectra of the developed clusters.

Fig. S6 Raman Spectra of AuC1, AuC2, AuC3 and AuC4. Individual and magnified spectra of AuC1, AuC2, AuC3 and AuC4 in the range 1000 to 1700 cm\(^{-1}\) are shown in Fig S6a-d.
Fig. S7 Optimized geometry of self assembled structures, AuC1 (a), AuC2 (b), AuC3 (c) and AuC4 (d). In all the cases 4 repeated units are shown. Au, S, C, O and N are represented in brown, orange, yellow, red and blue respectively.
**Fig. S8** Optimized geometry of self assembled structures AuC4 showing the pattern similar to the one observed in the TEM image. Note the central gap.

**Fig.S9** CT image of the developed cluster
Fig. S10: Optical imaging of the developed clusters shown along with the color coded efficiency bar.

![Fig. S10](image)

Day 0                                Day 1

![Day 0 Image](image)                ![Day 1 Image](image)

Fig. S11: *In vivo* optical imaging potential of AuC3 in mouse and its clearance from the body on the next day shown along with the color coded efficiency bar.