Fig S1. XRD pattern of evolution for tetragonal LaVO<sub>4</sub> nanocrystals with catechin hydrate (a) 0.1 (b) 0.08, (c) 0.05, (d) 0.03, (e) 0.01, (f) 0.008. Standard XRD patterns of monoclinic (JCPDS No 50-0367) and tetragonal (JCPDS No 10-705226) are also shown. All Samples Were Hydrothermally Treated at 180 °C for 24 h



Fig S2. FESEM image of L1



## Fig S3. HRTEM image of L2



Fig S4. HRTEM image of L3



## Fig S5. HRTEM image of L4





Fig S6. FESEM image of L5



Fig S7. HRTEM image of L6.



Fig S8. FESEM image of L6



Fig S9. DLS profiles of LaVO<sub>4</sub> nanocrystals with different morphology (a) Sphere, (b) Square nanoplate and (c) Rod



Fig S10. Size distribution histogram of L4(a),L5(b),L6(c) from TEM presented in Fig 8,9,10 respectively.



Fig S11. Thermogram of LaVO<sub>4</sub> nanocrystals with different morphology (a) Rod, (b) Square nanoplate and (c) Sphere.



Fig S12. XRD pattern of  $Eu^{3+}$  doped  $LaVO_4$  in rod(a), square nanoplates(b) and sphere(c) shape morphology. All Samples Were Hydrothermally Treated at 180 °C for 24 h



Fig S13. XRD pattern of  $\text{Sm}^{3+}$  doped LaVO<sub>4</sub> in rod (a), square nanoplates (b) and sphere(c) shape morphology. All Samples Were Hydrothermally Treated at 180 °C for 24 h



Fig S14. EDAX spectra and composition of  $Eu^{3+}$  (a) and  $Sm^{3+}$  (b) doped LaVO<sub>4</sub> nanocrystals in L5. . All Samples Were Hydrothermally Treated at 180 °C for 24 h





Fig S15. Size distribution histogram of Eu3+ (a) and Sm3+ (b) doped LaVO<sub>4</sub> nanocrystals from TEM presented in Fig 10.





Fig S16. CIE chromaticity diagram of Eu3+(a) and Sm3+(b) doped LaVO4 in different shapes.





Table S1. Contact Angle Data on doped LaVO<sub>4</sub> nanoparticles under different morphology for Dodecane (DD), Glycerol (G) and Water (W)

| Morphology        | Dopant | DD   | G       | W      | Surface energy |
|-------------------|--------|------|---------|--------|----------------|
|                   |        |      |         |        | $(mJ/m^2)$     |
| Rod               | Eu     | 4.24 | 34.922  | 28.284 | 64.14          |
|                   | Sm     | 5.32 | 31.003  | 25.182 | 65.88          |
| Square nanoplates | Eu     | 3.84 | 28.504  | 31.775 | 62.86          |
|                   | Sm     | 4.24 | 33. 157 | 30.984 | 63.01          |
| Nanospheres       | Eu     | 3.50 | 36.763  | 31.467 | 62.44          |
|                   | Sm     | 3.69 | 33.956  | 27.764 | 64.47          |