

Supplementary Materials

Tailoring the Radionuclide Encapsulation and Surface Chemistry of $\text{La}(^{223}\text{Ra})\text{VO}_4$ Nanoparticles for Targeted Alpha Therapy

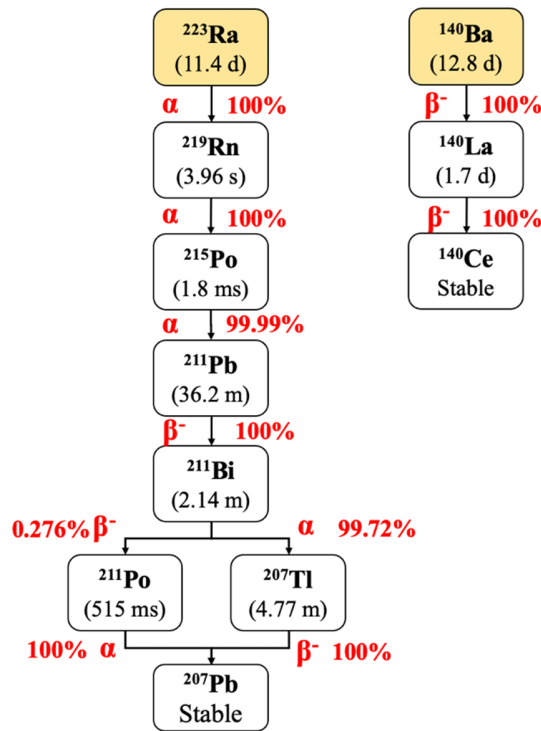


Figure S1. Decay schemes of ^{223}Ra and ^{140}Ba .

Table S1. Summary of γ -ray energies and intensities used to calculate the activity of each radionuclide [1].

Radionuclide	γ -ray energy (keV)	Intensity (%)
^{223}Ra	144.23	3.27
	154.08	5.70
	269.46	13.90
^{211}Pb	404.85	3.78
	832.01	3.52
^{211}Bi	351.07	13.02
^{140}Ba	162.66	6.22
	304.85	4.29
	537.26	24.39
^{140}La	328.76	20.30
	487.02	45.50
	815.77	23.28

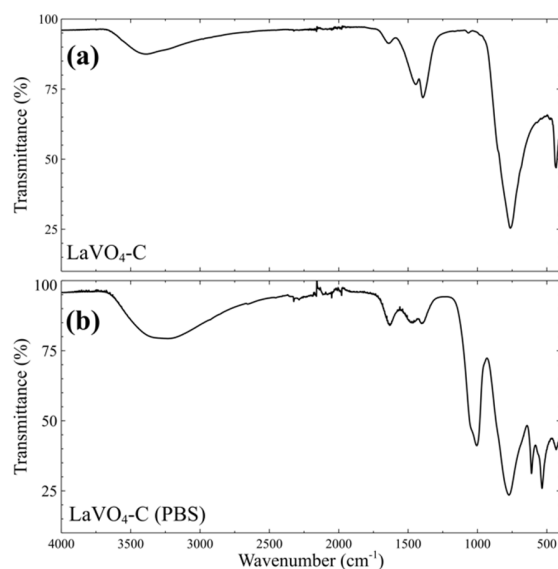


Figure S2. Dispersion of LaVO₄ NPs in phosphate-buffered saline (PBS; 1X, pH = 7.4) results in the addition of phosphate groups on the particle surface. FTIR spectra of LaVO₄ NPs synthesized following procedure C (a) before and (b) after dispersion in PBS.

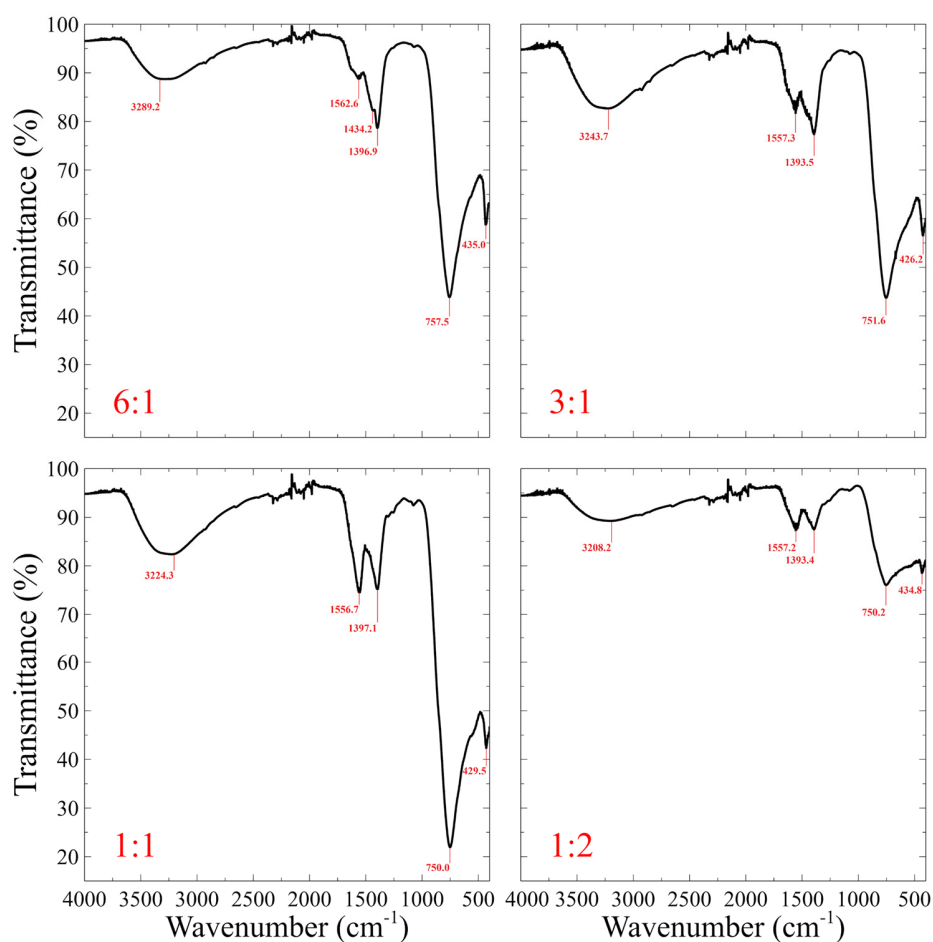


Figure S3. Increase molar fraction of NH₄-Cit results in the appearance of the carboxylate bidentate bond stretching band at ~1,560 cm⁻¹, where a 1:1 LaVO₄:NH₄-Cit molar ratio exhibits the highest transmittance for the carboxylate bidentate bond stretching band. FTIR spectra of LaVO₄ NPs modified with NH₄-Cit at different LaVO₄:NH₄-Cit molar ratios.

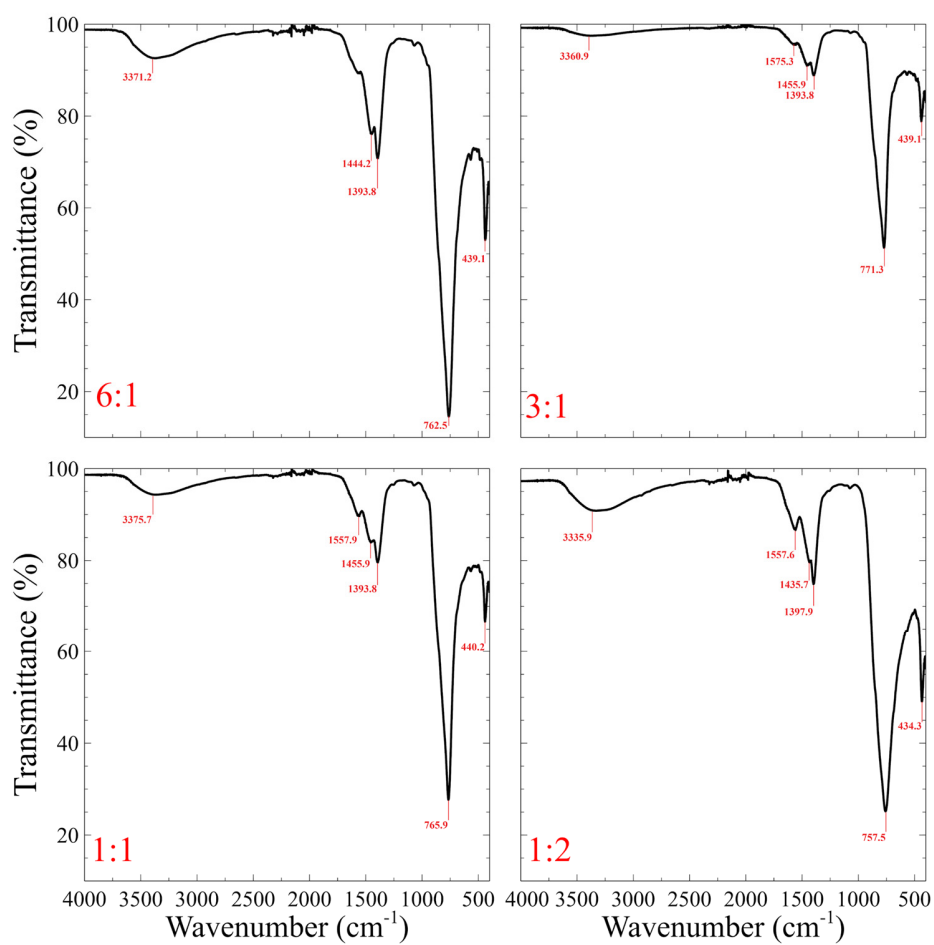


Figure S4. Carboxylate bidentate bond stretching band at $\sim 1,560\text{ cm}^{-1}$ is evidenced at LaVO₄:Na-Cit molar ratios greater than 1:1. FTIR spectra of LaVO₄ NPs modified with Na-Cit at different LaVO₄:Na-Cit molar ratios.

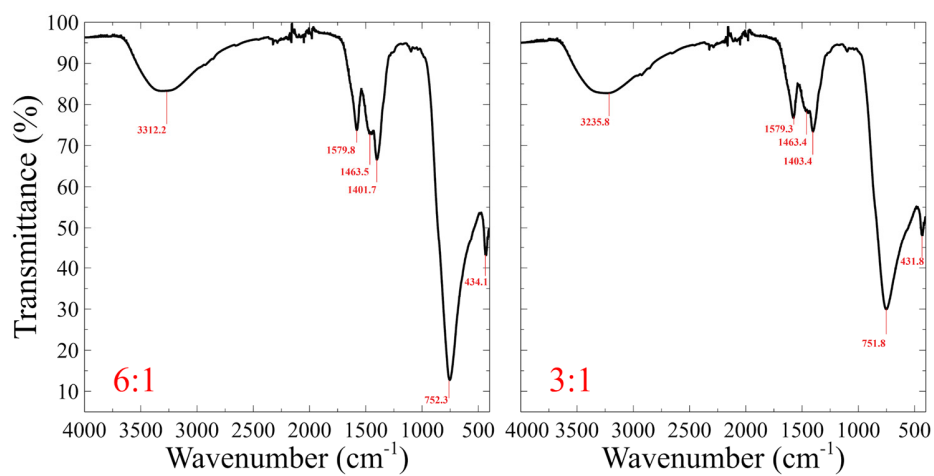


Figure S5. Surface modification with EDTA is evidenced by the carboxylate bidentate bond stretching band $\sim 1,580\text{ cm}^{-1}$. A shift of the carboxylate bidentate bond stretching relative to $\text{NH}_4\text{-Cit}$ and Na-Cit suggest differences in the coordination of the carboxylate groups around the La cation. FTIR spectra of LaVO_4 NPs modified with EDTA at different $\text{LaVO}_4\text{:EDTA}$ molar ratios.

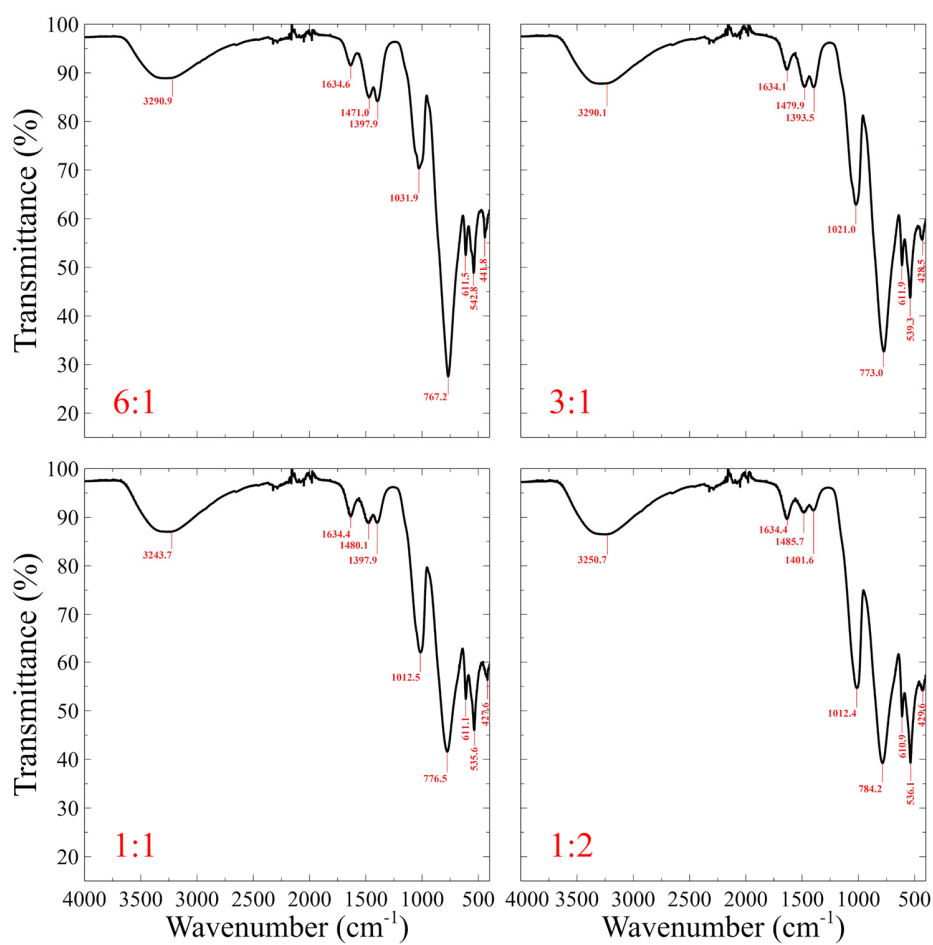


Figure S6. LaVO₄ NPs modified with TPP exhibited characteristic phosphate vibration bands at LaVO₄:TPP molar ratios as low as 1:6. FTIR spectra of LaVO₄ NPs modified with TPP at different LaVO₄:TPP molar ratios.

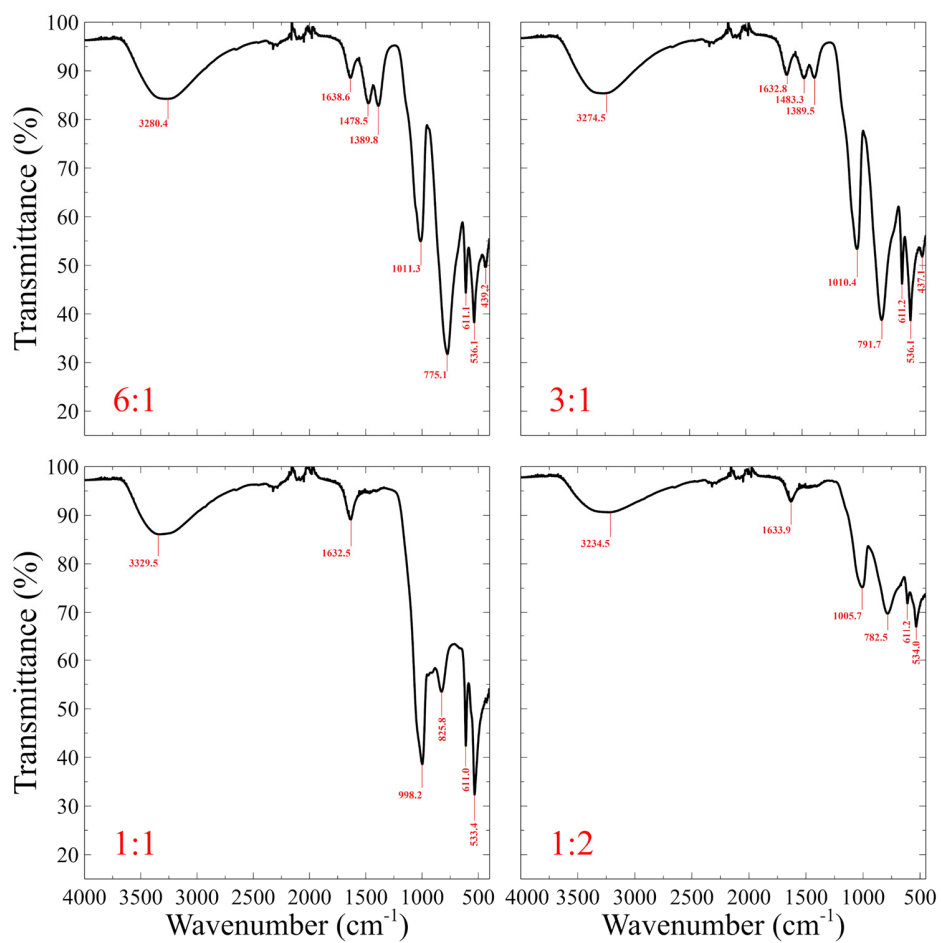


Figure S7. Characteristic phosphate vibration bands observed in LaVO₄ NPs modified with Hex at LaVO₄:Hex molar ratios as low as 1:6. LaVO₄:Hex molar ratios greater than 1:1 removed the vibration bands corresponding to carboxylate groups from precipitation of carbonate species. FTIR spectra of LaVO₄ NPs modified with Hex at different LaVO₄:Hex molar ratios.

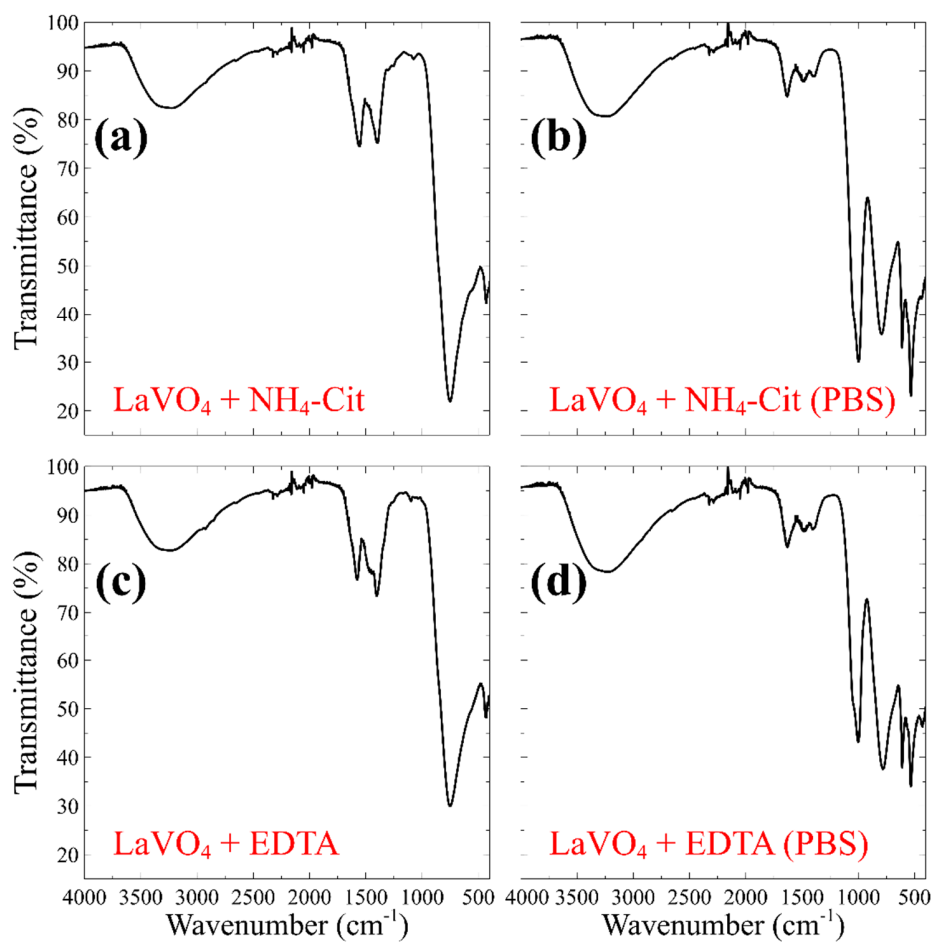


Figure S8. Presence of phosphate vibration bands after dispersing $\text{LaVO}_4 + \text{NH}_4\text{-Cit}$ and $\text{LaVO}_4 + \text{EDTA}$ in PBS. FTIR spectra of $\text{LaVO}_4 + \text{NH}_4\text{-Cit}$ and $\text{LaVO}_4 + \text{EDTA}$ NPs (a, c) before and (b, d) after dispersion in PBS (1X, pH = 7.4).

References

- [1] “Nudat 2.” <https://www.nndc.bnl.gov/nudat2/> (accessed Jun. 12, 2020).