Hybrid HPV capsid protein L1 and giant, Mo-containing polyoxometalate improves the stability of virus-like particles and the anti-tumor effect of [Mo_{154}]

(ESI)

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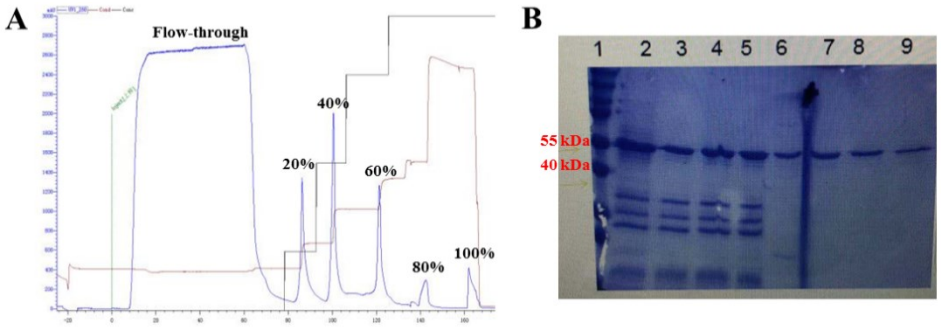

Fig. S1 (A) FPLC elution profile of HPV 16 L1 in different NaCl concentrations, and (B) the corresponding SDS-PAGE for the products: panel 6-9 are the elution from 80% NaCl while those at panel 2-5 are from 60% NaCl for comparison.

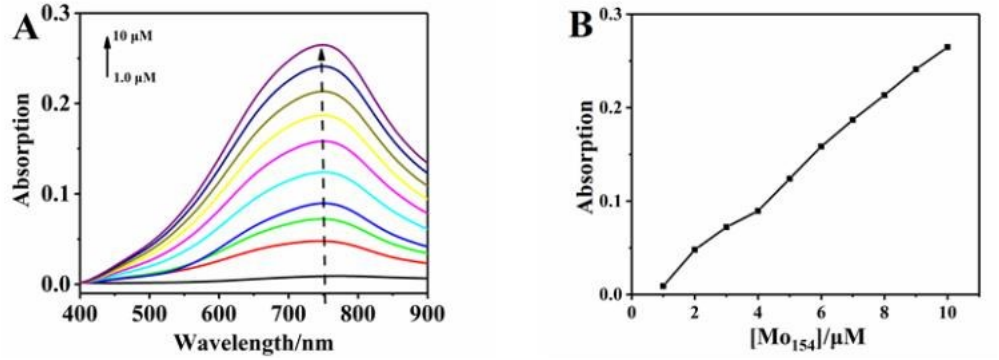

Fig. S2 UV-vis absorption spectrum and the corresponding intensity of [Mo_{154}] at different concentrations. No aggregate was shown for [Mo_{154}] among the test concentration range.

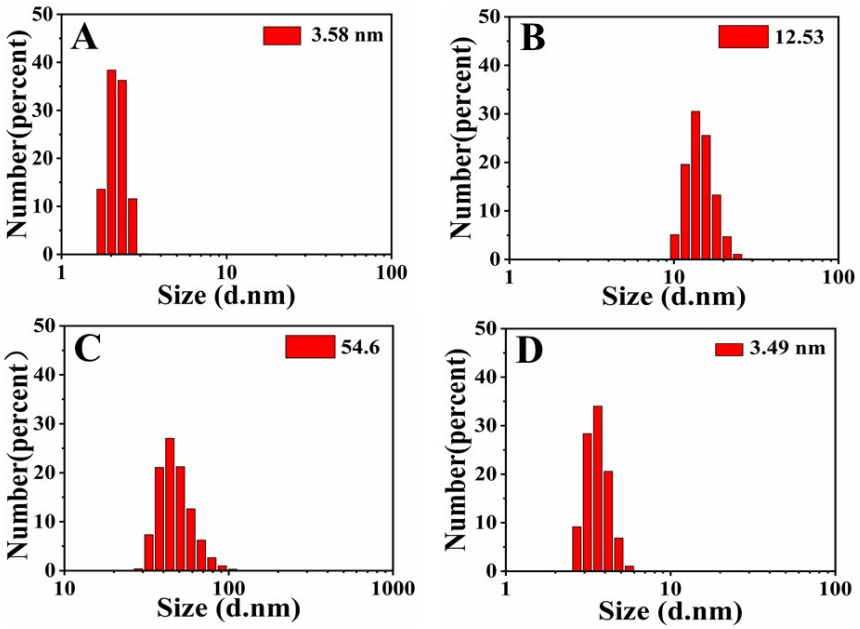

Fig. S3 DLS histogram of (A) [Mo_{154}] in buffer A; the mixture of (B) L1-p and [Mo_{154}], (C) as-prepared VLPs and [Mo_{154}], and (D) the extract of F1#b as control after CsCl gradient ultracentrifugation. The final concentration of protein and [Mo_{154}] is 10 μM, respectively.

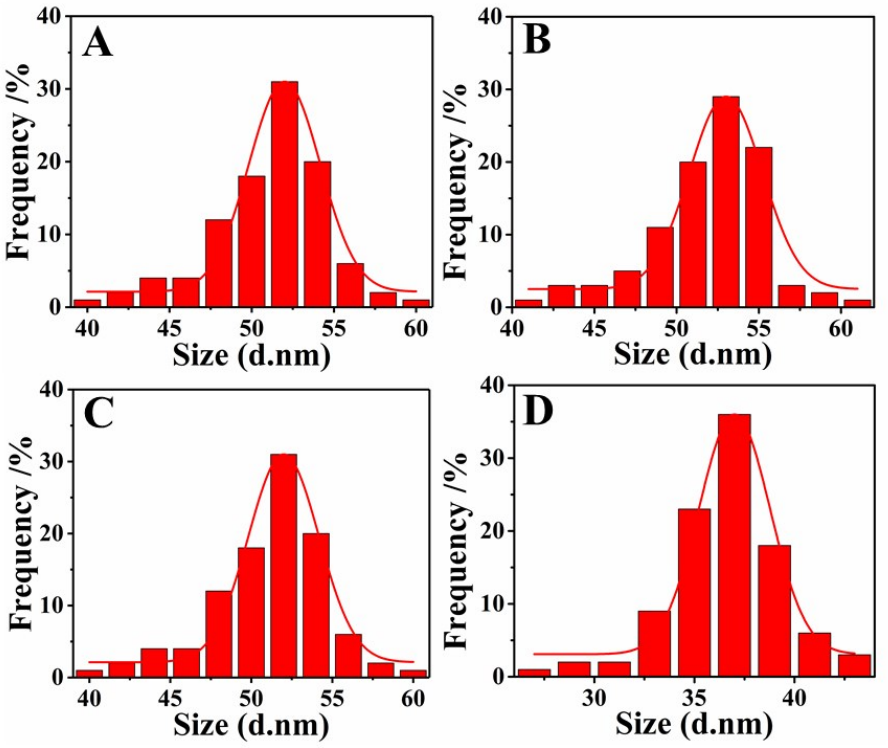

Fig. S4 Size distributions of (A) [Mo_{154}]@VLPs, (C) VLPs@[Mo_{154}] being stained with 2% phosphotungstate 2 min before measurements; and those of (B) [Mo_{154}]@VLPs, (D) VLPs@[Mo_{154}] without negative stain. They are evaluated based on 200 particles obtained from the corresponding TEM images.

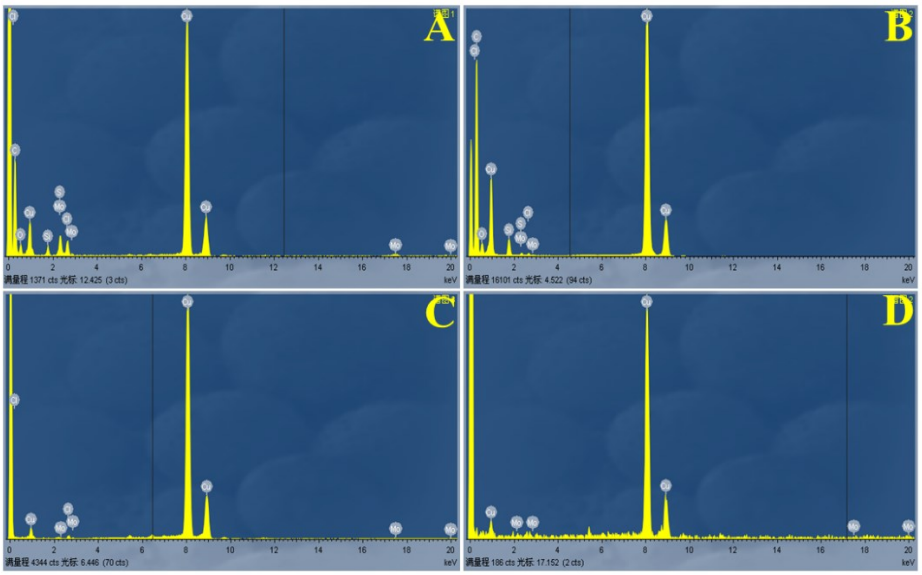

Fig. S5 Energy-dispersive X-ray spectrum (EDS) measured on a representative particle shown in the TEM image for (A) [Mo_{154}]@VLPs, (C) VLPs@[Mo_{154}] stained with 2% phosphotungstate 2 min before measurements; (B) [Mo_{154}]@VLPs, (D) VLPs@[Mo_{154}] without stain. The Cu shown is a copper net rather than pollutants in the sample.

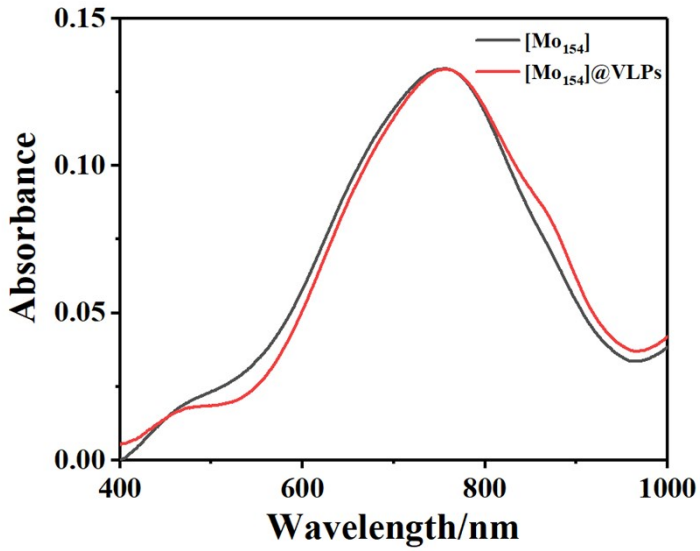

Fig. S6 UV/Vis absorption spectrum of [Mo154] and [Mo154]@VLPs in assembly buffer solution (4 μM), respectively.

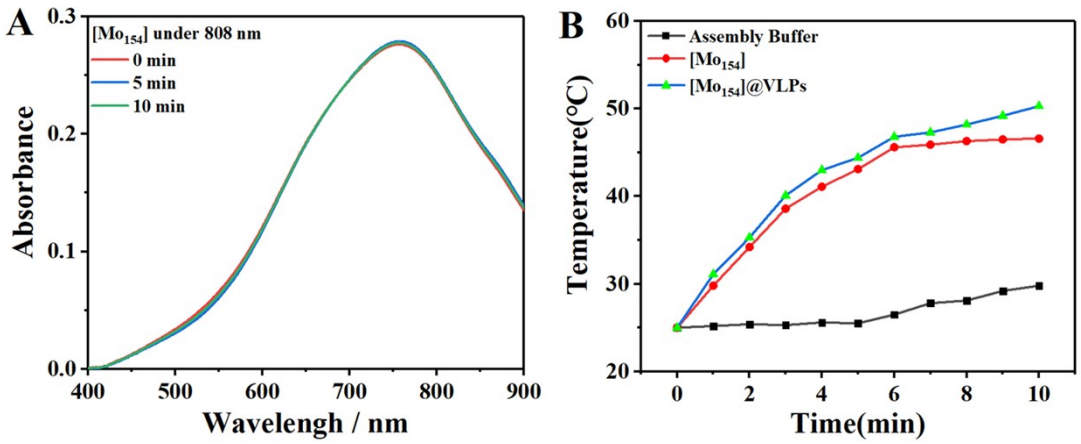

Fig. S7 (A) UV-vis absorption spectra of [Mo154] (10 μM) under the irradiation of 808 nm for 0, 5, and 10 min, respectively. (B) Photothermal heating curves of 10 μM [Mo154] and 10 μM [Mo154]@VLPs in the assembly buffer, respectively, and the blank buffer solution under irradiation of 808 nm (1 W cm^{-2}).