Electronic Supplementary Material (ESI) for Nanoscale.

Exciton emissions in KP_{15} nanowires

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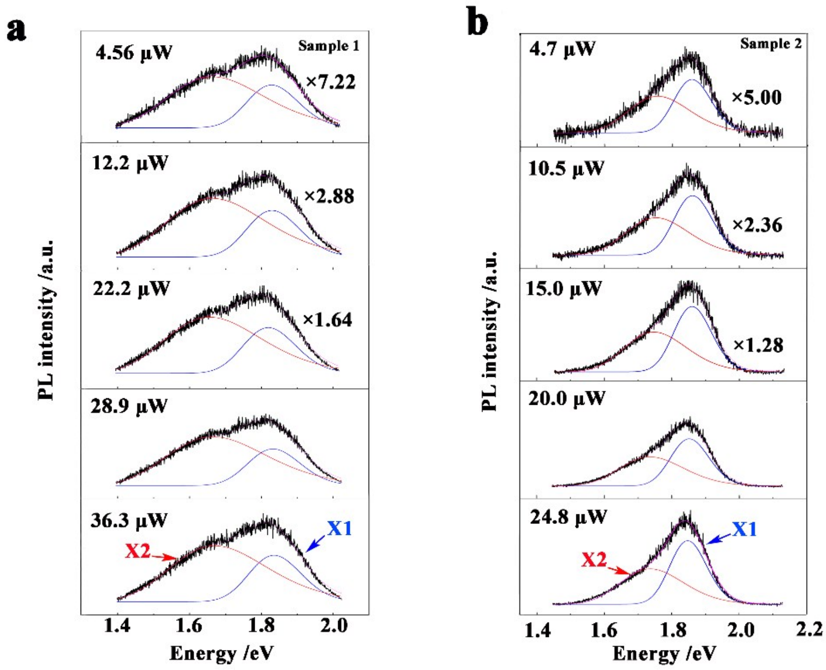


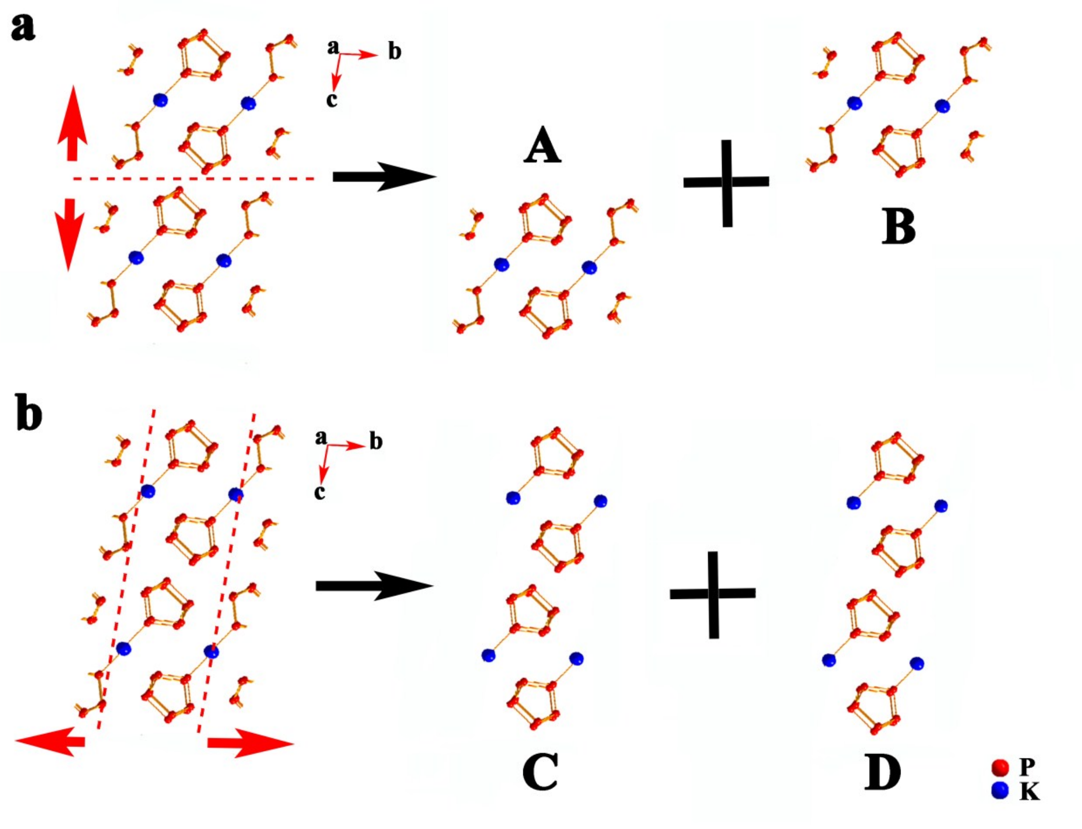
Supplementary Figure S1. (a) PL spectra of sample 1 at different excitation powers. (b) PL spectra of sample 2 at different excitation powers.

Binding strength calculation

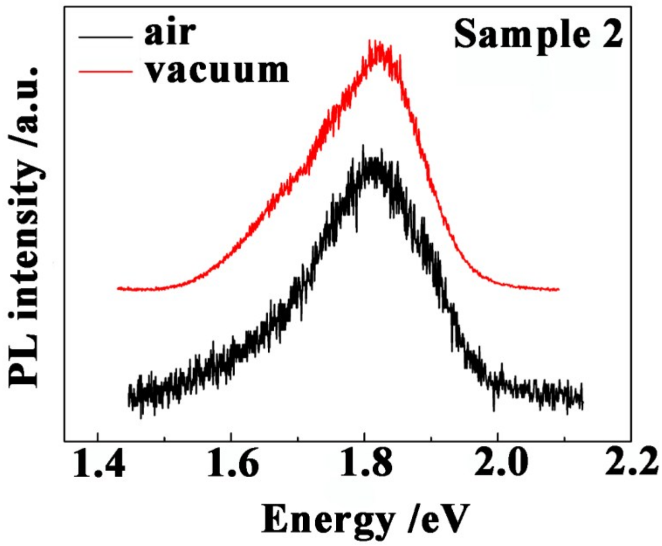
To clarify the difference in binding strength between these two types of force (between layers connected with van der Waals interactions, and between tubes connected with alkali metal atoms), we performed a calculation using KP_{15} as an example. We constructed a supercell of KP_{15} as a complete configuration that could be cut between the layers (marked as a red dashed line) into A and B portions or between tubes (marked as a blue dashed plane) into C and D portions (Supplementary Figure S2). We cut the complete configuration into two portions along the two directions mentioned above and calculated the binding energy of the portions relative to the original configuration to evaluate the difficulty of separating bulk KP_{15} along these two directions:

$$\triangle E = E_{p1} + E_{p2} - E_0$$

where $\triangle E$ is the binding energy, E_{p1}, E_{p2}, and E_0 are the total energies of the portions and the original configuration, respectively. Schematic diagrams of the original and portion configurations are shown in Supplementary Figure S2. The calculated binding energy along the layers direction was 5.34 eV and along the tubes direction was 17.38 eV. The binding energy along the tubes direction was only 3.25 times larger than it was along the layers direction. That may indicate that P tubes connected by Coulomb forces can be separated during exfoliation.



Supplementary Figure S2. (a) The super cell of KP_{15} cut along the layers direction. (b) The super cell of KP_{15} cut along the tubes direction.



Supplementary Figure S3. PL properties of sample two in air and vacuum at room temperature.