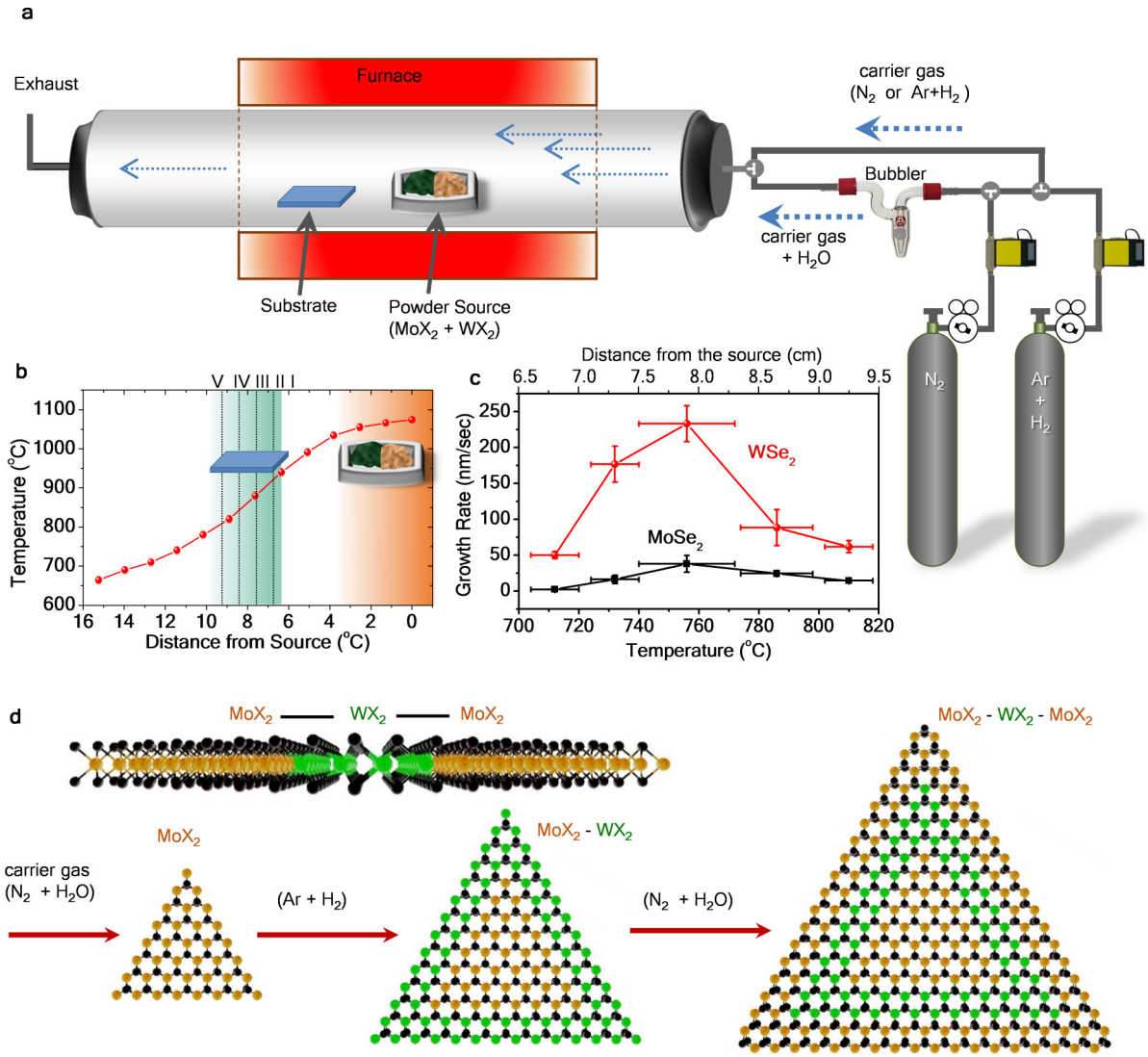

Extended Data Figure 1 | One-pot synthetic approach for sequential edge-epitaxy of TMDs. a, Schematics of the modified chemical vapour deposition system that allows the alternate switching of carrier gas that generates the selective edge-epitaxial growth for multi-junction heterostructure synthesis. Note that water vapour is introduced by passing the carrier gas through the bubbler. The carrier gas is selected by a three-way valve placed at the entrance of the quartz tube reactor. **b**, Temperature profile of the furnace, a single heterogeneous source containing both precursors is placed in the high-temperature zone, whereas the substrates are placed downstream at the lower-temperature zone. **c**, Growth rates for $MoSe_2$ and WSe_2 domains as a function of the substrate temperature. The error bars along the *y* axis denote the mean standard deviation ($\pm\delta$), and error bars along the *x* axis represent the average length of a typical growth region denoted in **b**. **d**, Atomic ball model, showing the material distribution across the heterostructure in cross-section (top) and plane view (bottom).