

Growth of nanowires with periodic morphologies via the vapor-liquid-solid mechanism

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The vapor-liquid-solid (VLS) process has been widely used to growth different one-dimensional nanostructures. Among these nanostructures, some show periodic changes in morphology (e.g. diameter oscillation). Our analysis show that the periodic morphological changes in a wide ranges of periodic 1D nanostructures can in fact be described by two simple linear relations: (1) inverse of the periodic spacing along the length direction follows an arithmetic sequence; and (2) the periodic spacing in the growth direction varies linearly with the diameter of the nanostructure (figure 1). These two simple relations can be explained by a surface curvature oscillation model in which the surface tension in a VLS growth system is strongly modulated by the nanometer size effect.

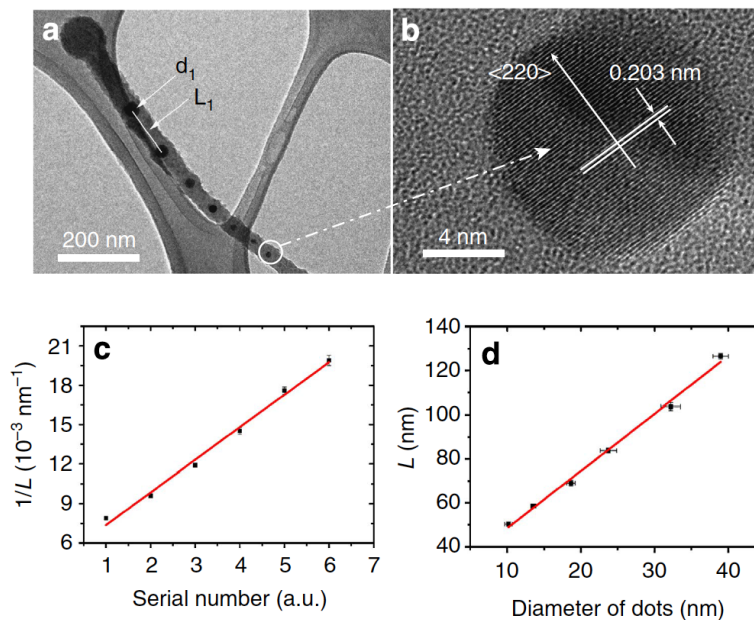


Figure 1 Periodic Si nanodots obtained by VLS growth. (a) A TEM image of the product. (b) An HRTEM image of a nanodot in (a). (c) Plot of the $1/L$ against serial number. (d) Plot of diameter of Si nanodots against L .