Growth of TMD Nanoribbons for Quantum Electronics

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The dependence of single atomic layer materials band structure on their width and internal strain offers a new dimension for realization of quantum electronic and optoelectronic devices. Therefore, developing facile methods for their controllable synthesis is of central importance. We will present surfactant-mediated growth of single atomic layer of transition metal dichalcogenides (TMD) nanoribbons from nanoparticles of Ni-Me-Na-S (M=Mo, Se, S2 and Se) via vapor-liquid-solid mechanism. The width of the precipitated nanoribbons (7-100nm) correlated with the size of the seed nanoparticle. We observed width-dependent Coulomb blockade oscillation observed in the transfer characteristics of the nanoribbon's with width less than 20nm at temperatures up to 60 K. Moreover, remarkable flexibility of grown nanoribbons and resilience to the high strain allows to realize clean quantum emission associated with deformation induced in the electronic states. The method provides basic synthesis route for atomic scale width control quantum nanoribbons of metal dichalcogenides for potential applications in the quantum electronics.