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Few-layer-thin Two-dimensional Metallic Niobium Disulfide Nanosheets: Preparation, Optical Characterization and Transport Properties[1] SIHAN ZHAO, TAKATO HOTTA, TAKUMI SAWAZAKI, MITSUHIRO OKADA, HISANORI SHINOHARA, RYO KITAURA, Nagoya Univ, SHINOHARA'S GROUP TEAM — The semiconducting two-dimensional (2D) transition-metal dichalcogenides (TMDs), such as MoS2, WS2 etc., have recently attracted tremendous research attention in the field of materials science. On the other hand, research work on 2D metallic TMDs, such as NbS2, NbSe2 etc., which show superconductivity and charge-density-wave (CDW) states in bulk, has been limited primarily due to the inaccessibility to ultrathin high quality samples. In this contribution, we report a direct chemical vapor deposition (CVD) growth of ultrathin 3R-NbS2 nanosheets down to 3 layers on the exfoliated hexagonal boron nitride (hBN) flakes. AFM data show that most of NbS2 samples grown are very thin with an average lateral size of ca. 2 3 m. Detailed Raman spectroscopy studies on layer number-identified NbS2 samples reveal a systematic shift of out-of-plane vibration mode (A1g), which offers a reliable and rapid optical method for layer number identification. Two-terminal devices on thin-layered NbS2 were also fabricated and show a metallic transport behavior as predicted by DFT calculations. The metallic nature of thin-layered NbS2 has also been supported by absence of PL peaks regardless of number of layers. Exploration of 2D superconductivity and CDW states in this system is an on-going work.

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