Tohoku Univ. Technology

Synthesis method for position controllable transition metal dichalcogenide

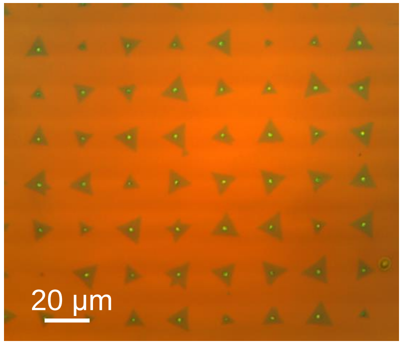
Avoid size dispersion, able to synthesize single crystal

Overview

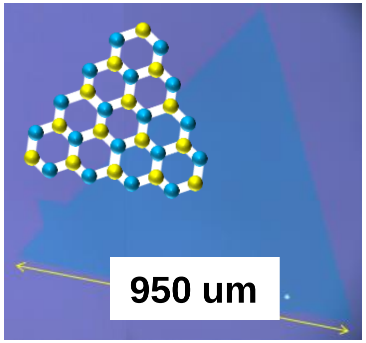
Transition metal dichalcogenide (hereinafter “TMD”) is an atomic material layer with thickness of an atom, which has a bandgap in the visible range and behaves as a semiconductor. The conventional synthesis method is the chemical vapor deposition (CVD) where TMD is synthesized at random position on the circuit board. The position control of the synthesis is essential in order to apply TMD on different devices but the conventional synthesis method doesn’t allow that. The synthesis method with controlled position is also proposed but a polycrystalline TMD is synthesized and it is not convenient to apply to different devices.

This invention solves above issues and can provide a synthesis method of monocrystalline TMD or heterojunction TMD by controlling its position using micro dots as a growing core while limiting the size dispersion.

Optical microscope image of single crystalline TMD synthesized using Au dots

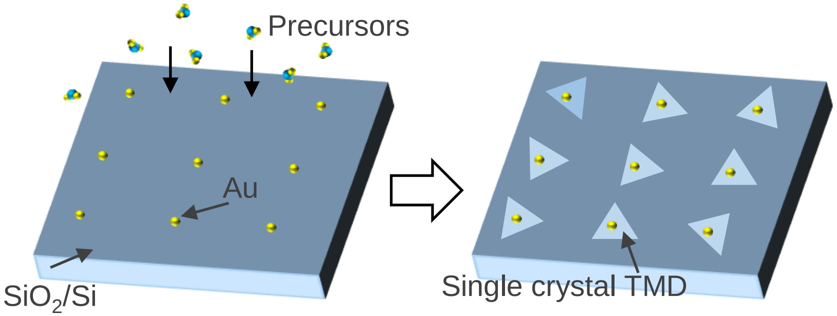


Ultra large single crystal TMD



Position controlled monocrystalline TMD / heterojunction TMD synthesis method

Application to electronic component material as semiconductor



Single crystalline TMD synthesis process of this invention

Large single crystal WS_2 (size: <1000 um) on SiO_2/Si is now available!

Product Application

- ☐ Application to different devices using TMD
- ☐ Next generation semiconductor device material
- ☐ Schottky type solar cell

Related Works

[1] Sci. Rep. 11 (2021) 22285

[2] Sci. Rep. 9 (2019) 12958

IP Data

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