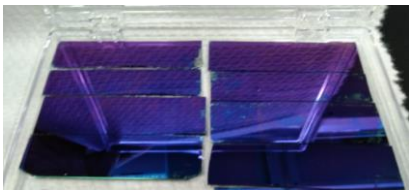
從化學氣相沉積在堆疊基底上合成過度金屬硫化物薄膜的方法

提案人： 謝馬利歐 副教授
單　位： 國立臺灣大學　物理學系/研究所
簡　歷： http://mylabntu.weebly.com/professors.html



市場及需求:

由於電晶體已經到了尺寸的極限，要更縮小尺寸，首先半導體材料的厚度必須先降低。而二維材料是世界上最薄的材料。
本專利是生長可商業化品質與量化生產二維過渡金屬硫化物的製程. 過渡金屬二硫族化物 (transition metal dichalcogenides) MX_2 (M: Trnasition Metal, such as V, Nb, Ta, Cr, Mo, W, Ni, Pd, Pt; X: S, Se, Te), 在單層晶體結構與石墨烯相似, 如二硫化鉬(MoS2)、二硫 化鎢(WS2)、二硒化鉬(MoSe2)、二硒化鎢(WSe2) 等, 歸屬於二維層狀半導體材料。如同石墨烯, 此種單層二維且只有原子層厚度的材料不只有非常好且特殊的光學特性, 在做成場效電晶體也具有很好的電流開關比, 對於下一個半導體, 電子及光電子世代, 為極具潛力的重要材料。但目前市面上因生產方式極沒效率，售價約為 1cm2=500usd. 且品質不佳，價格昂貴，因此不具商業化價值。

技術摘要(含成果):

1. 使用金屬氧化物薄膜為前驅物, 加上層層相疊的設置, 能夠在有限的化學氣相層積反應空間內, 生長出高產率, 高品質並且大面積的單原子層過渡金屬硫化物。 直接疊層技術在於利用這種 Confinement 讓鹽類散佈的均勻。

2. 若在金屬源上(wo3)鍍上其他金屬(ex: Ti, Mo,Pd, Pt…) ，可以合成出高品質二元及三元合金 (ex $WTiS_2$, $WPdS_2$..)

3. **利用氣體的硫/硒/碲源(ex:H_2S, H_2Se, H_2Te)，可以增加擴散長度，有助於疊層生長大面積的 TMDC**

優勢:

高品質並且大面積的單原子層過渡金屬硫化物, 直接疊層生長有助於單原子層過渡金屬硫化物的大量產出。且品質極高。

競爭產品:

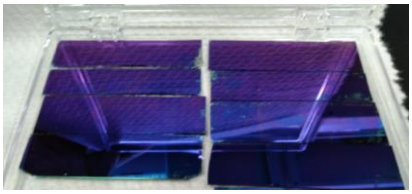
傳統 CVD 生長的過度金屬硫化物

專利現況:

申請中

聯絡方式(請不用填):

Method for synthesizing TMDc thin film on a stacked substrate directly from chemical vapor deposition synthesis



PI： Prof. Ya-Ping Hsieh and Mario Hofmann
Department of Physics, National Taiwan U.

Experience:
http://mylabntu.weebly.com/professors.html

Market Needs:
This patent is a process for growing commercially viable quality and quantifying the production of two-dimensional transition metal sulfides. Transition metal dichalcogenides, similar in structure to graphene in single-layer crystal structures, such as molybdenum disulfide (MoS2), Tungsten disulfide (WS2), molybdenum diselenide (MoSe2), tungsten diselenide (WSe2), etc., are attributed to two-dimensional layered semiconductor materials. Like graphene, this single-layer two-dimensional and atomic layer-thickness material has not only very good but special optical properties, but also has a good current-switching ratio for field-effect transistors, for the next semiconductor, electronics and Optoelectronic generation is an important material with great potential for semiconductor device applications.

Our Technology:
The use of a metal oxide film as a precursor, combined with a layered arrangement, enables the growth of high yield, high quality and large area monoatomic layer transition metal sulfides in a limited chemical vapor deposition reaction space.

Strength:
High quality and large area monoatomic transition metal sulfides, stack growth contributes to the large yield of monoatomic layer transition metal sulfides.

Competing Products:
Traditional CVD synthesis of TMDcs

Intellectual Properties:
Application in progress

Contact (do not need to fill out):