課題番号 :F-13-AT-0085
利用形態 :機器利用
利用課題名(日本語) :AFM を用いた $MoS_2$フレークの厚さ評価
Program Title (English) :The characteristic of thickness of MoS2 flakes by AFM
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Affiliation (English) :FIRST program "Development of Core Technologies for Green Nanoelectronics"

## 1. 概要(Summary)

Two-dimensional materials offer an attractive possibility for using in next-generation nanoelectronics devices. Because the band gap of graphene is zero, devices with graphene are not suitable for logic application. Unlike graphene, there is an indirect band gap in the bulk and a direct gap in monolayer of transition metal dichalcogenides (2D TMDs) [1]. In 2D TMDC materials, $MoS_2$, one of 2D TMDs family material has a promising near-term application of flexible and transparent transistors[2]. In this work, in order to investigate the field-effect mobility and voltage threshold of $MoS_2$ transistors, we used the atomic force microscope (AFM) of NPF to evaluate thickness of $MoS_2$ flakes.

## 2. 実験(Experimental)

$MoS_2$ flakes were transferred to p-doped silicon substrate with 285-nm-thickness of $SiO_2$ by mechanically exfoliation from natural bulk by standard scotch tape. The thickness of ultrathin flakes was evaluated by AFM(SFT-3500).

## 3. 結果と考察(Results and Discussion)

Fig.1 shows AFM image. Fig.2 shows the thickness of one of flakes. $MoS_2$ FET. The average thickness is around 3 nm.

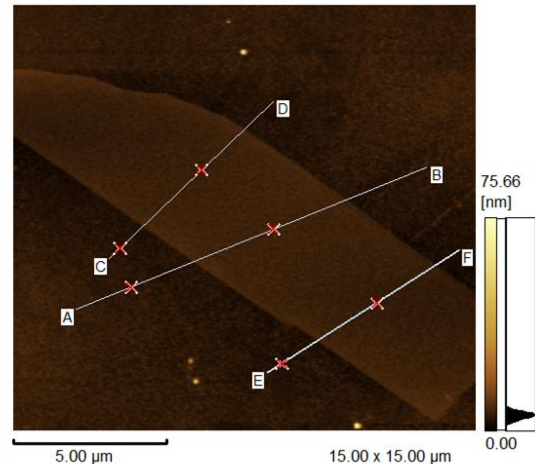


Fig.1 AFM image of thin flake of $MoS_2$.

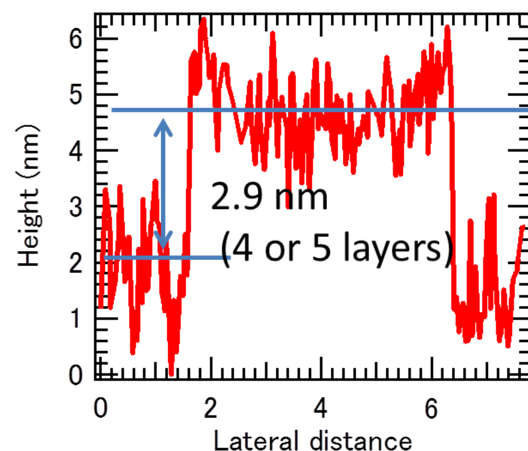


Fig. 2 Cross-sectional plot of AB line in Fig.1.

## 4. その他・特記事項(Others)

・参考文献

1) Mark, K.F etal., Phys. Rev. Lett. **105,** 136805 (2010).
2) Qing Hua Wang et al., Nat. Nanotechnol. **7,** 699 (2012).

## 5. 論文・学会発表(Publication/Presentation)

なし。

## 6. 関連特許(Patent)

なし。