

課題番号 : F-15-UT-0004
利用形態 : 機器利用
利用課題名(日本語) :
Program Title (English) : Thermal transport property measurement of single-walled carbon nanotubes
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1. 概要(Summary)

The length dependence of the thermal conductivity of single-walled carbon nanotubes have long been discussed through molecular dynamics simulation, however, no agreement has been reached about whether it will convergence and the convergence length. Besides, no experiment has been conducted concern to this problem. To measure the thermal conductivity of single single-walled carbon nanotube, the microdevice (by MEMS) particular for this purpose have to be fabricated and then transfer the horizontally grown carbon nanotube onto it.

2. 実験(Experimental)

【利用した主な装置】

高速大面積電子線描画装置

光リソグラフィ装置 MA-6

汎用 ICP エッチング装置

【実験方法】

Since the serpentine Pt foil used for heating is very narrow (400 nm), Electron Beam (EB) lithography is used to pattern the EB resist for the following Ti/Pt electrodes deposition. The second Electron Beam lithography comes after to pattern the later suspended silicon nitride features. Subsequently, the unwanted silicon nitride is etched away with CHF₃ gas. Next, a backside photolithography is conducted to open a window for the final release of the silicon nitride pad. Finally, the sample is immersed in KOH to etch the silicon and release the silicon nitride. After the microdevice is ready, single-walled carbon nanotube

will be transferred onto it with PMMA, then the third EB lithography is need to pattern the clamp for carbon nanotube.

3. 結果と考察(Results and Discussion)

The desired microdevice for nanoscale heat transfer measurement was basically achieved, shown in Fig. 1 is the SEM image of it while the releasing is partially done.

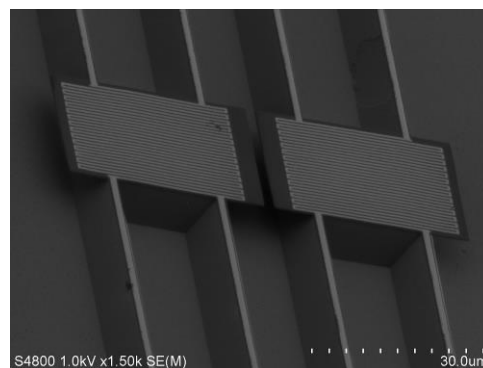


Fig. 1 SEM image of the microdevice for heat transfer measurement (only partially etched).

4. その他・特記事項(Others)

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5. 論文・学会発表(Publication/Presentation)

None

6. 関連特許(Patent)

None