マテリアル先端リサーチインフラ利用報告書
ARIM User's Report

【Release：2024.07.25】　【Update：2024.03.21】

課題データ / Project Data

課題番号 Project Issue Number	23UT1133
利用課題名 Title	In-situ monitor of single molecule functionalization behavior for electrically driven single photon emitters
利用した実施機関 Support Institute	東京大学 / Tokyo Univ.
機関外・機関内の利用 External or Internal Use	外部利用/External Use
ARIM半導体基盤PF 関連課題 Related to ARIM-SETI	指定なし / No Designation
横断技術領域 Cross-Technology Area	加工・デバイスプロセス/Nanofabrication
重要技術領域 Important Technology Area	次世代ナノスケールマテリアル/Next-generation nanoscale materials
キーワード Keywords	電子線リソグラフィ/ EB lithography,膜加工・エッチング/ Film processing/etching,ダイシング/ Dicing,ナノチューブ/ Nanotube

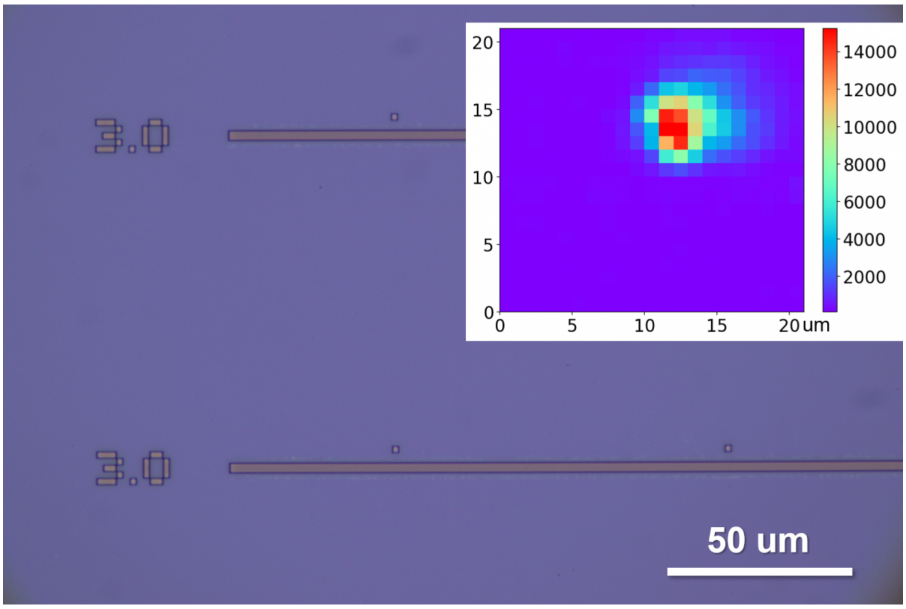
利用者と利用形態 / User and Support Type

利用者名（課題申請者） User Name (Project Applicant)	加藤 雄一郎
所属名 Affiliation	理化学研究所
共同利用者氏名 Names of Collaborators Excluding Supporters in the Hub and Spoke Institutes	Mengyue Wang,Daichi Kozawa
ARIM実施機関支援担当者 Names of Supporters in the Hub and Spoke Institutes	
利用形態 Support Type	機器利用/Equipment Utilization

利用した主な設備 / Equipment Used in This Project

利用した主な設備 Equipment ID & Name	UT-503：超高速大面積電子線描画装置 UT-604：高速シリコン深掘りエッチング装置 UT-900：ステルスダイサー

報告書データ / Report

概要（目的・用途・実施内容） Abstract (Aim, Use Applications and Contents)	We utilized the Takeda cleanroom facilities to fabricate trenches on silica substrates. By employing metal catalyst deposition and chemical vapor deposition techniques, we achieved successful synthesis of air-suspended carbon nanotubes with diverse chiralities. Additionally, we introduced quantum defects into the air-suspended carbon nanotubes after synthesis, and discussed their photoluminescence properties.
実験 Experimental	We utilized an electron beam lithography system and a silicon deep etching system to fabricate trenches of various widths on silicon substrates. Subsequently, we synthesized carbon nanotubes bridged within the trenches using chemical vapor deposition. These nanotubes were then subjected to reaction with aryl groups, and their photoluminescence properties were evaluated through microspectroscopy measurements (Figure 1).
結果と考察 Results and Discussion	We demonstrate the ability to introduce quantum defects into the air-suspended carbon nanotubes after synthesis, and elucidate their photoluminescence properties through a one-dimensional exciton diffusion model. Furthermore, from the photoluminescence characteristics, we observed the time depended spectral changes.
図・表・数式 1 Figures, Tables and Equations 1	 Figure 1 Image of the trenches on the silica substrate and the photoluminescence image of the air-suspended carbon nanotube
その他・特記事項（参考文献・謝辞等） Remarks(References and Acknowledgements)	

成果発表・成果利用 / Publication and Patents

DOI（論文・プロシーディング） DOI (Publication and Proceedings)	
口頭発表、ポスター発表および、その他の論文 Oral Presentations etc.	

特許出願件数 Number of Patent Applications	0件
特許登録件数 Number of Registered Patents	0件