開発フェーズ Development phase | **基礎開発 Basic development** | 仕様開発 Specification development | 開発完了 Development completion

転写可能な透明導電膜

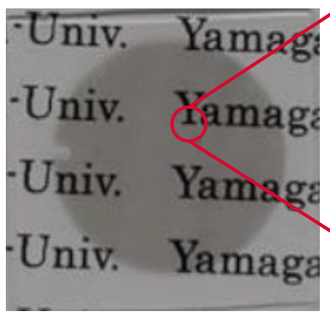
Transferable transparent conductive films

膜転写技術によりCNTネットワークを ペロブスカイト太陽電池の電極へ利用

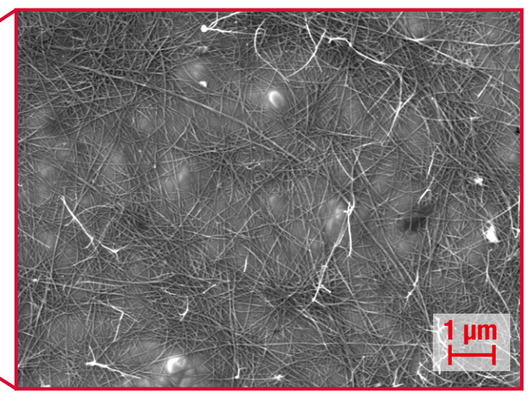
CNT networks can be applied to electrodes of perovskite solar cells by filter-transfer method

特徴 | Characteristics

- **直進性の高いカーボンナノチューブによる導電ネットワークが形成可能**
  Formation of conductive network with straight carbon nanotubes
- **透明性と導電性能を両立**
  Combines transparency and conductive performance



透過率80%膜(外観)
CNT membrane with 80% transmittance photograph

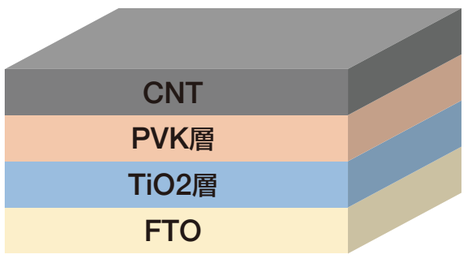


透過率80%膜(SEM像)
CNT membrane with 80% transmittance SEM image

用途例 | Applications

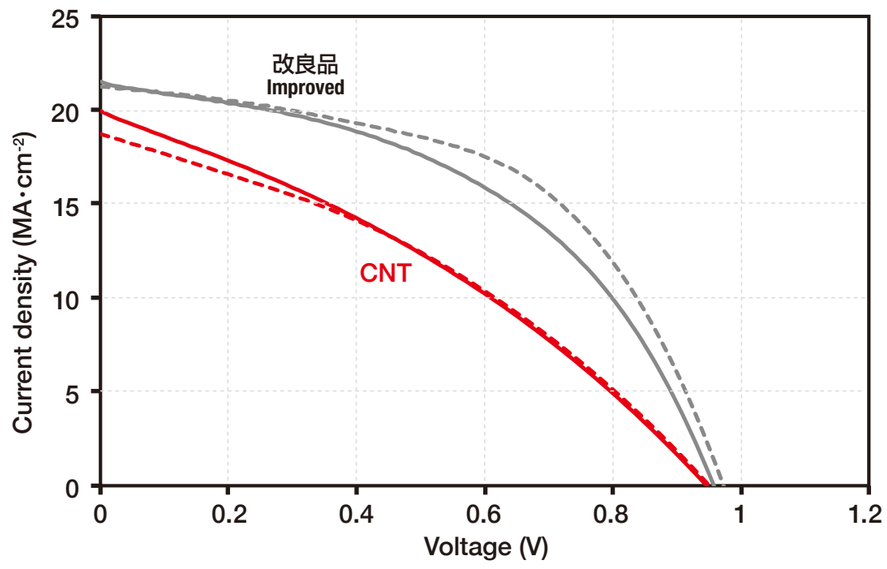
- **ペロブスカイト太陽電池(PSC):透過率60%CNT膜を電極に利用**
  Perovskite Solar Cell (PSC):
  Utilizes 60% permeability CNT membrane for electrodes

PSC外観
Photograph



構成の断面図
Schematic illustration of the PSC configuration

- 特性
  Characteristics



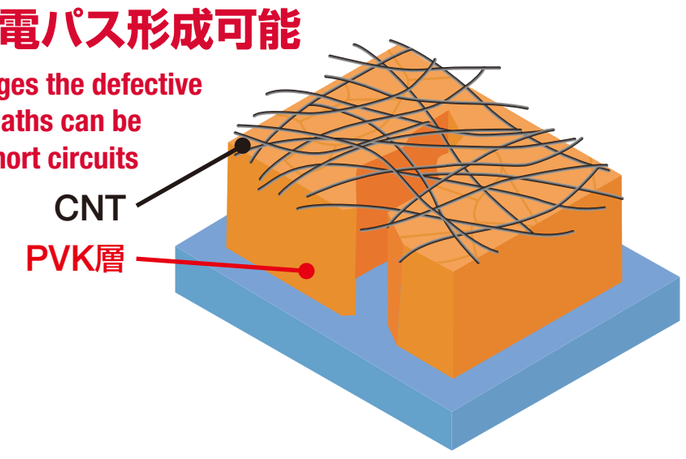
		J_{sc} / mA·cm^{-2}	V_{oc} / V	FF	PCE/%
CNT	forward	19.94	0.95	0.33	6.23
	reverse	18.71	0.95	0.35	6.28
改良品 Improved	forward	21.49	0.96	0.47	9.61
	reverse	21.22	0.97	0.53	10.9

実用化に向けた課題 | Issues for practical application

- **発電効率向上:大結晶ペロブスカイトの利用**
  Improved power conversion efficiency:
  Utilization of large crystal perovskite
- **設置自由度向上: 透明性、フレキシブル性**
  Improved installation: Transparency, flexibility
- **材料コスト低減**
  Material cost reduction
- **リサイクル容易性**
  Easy recycling

- ペロブスカイト結晶の大粒径化は欠陥ができやすい
  Large perovskite crystals are prone to defect formation

欠陥部をCNTネットワークが橋渡しすることで短絡なく導電パス形成可能
CNT network bridges the defective area conductive paths can be formed without short circuits



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