ENHANCING PHOTOLUMINESCENCE QUANTUM YIELD FOR HIGH PERFORMANCE OPTOELECTRICS

Tech ID: 25573 / UC Case 2016-079-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,852,927	12/26/2017	2016-079

BRIEF DESCRIPTION

Surface defects dominate the behavior of minority carriers in semiconductors and optoelectronic devices. Photoluminescence quantum yield (QY), which dictates efficiency of optoelectrics such as LEDs, lasers, and solar cells, is extremely low in materials with a large number of surface defects. Researchers at UC Berkeley and Lawrence Berkeley National Laboratory have developed a bis(trifluoromethane) sulfonamide (TFSI) solution for passivation/repair of surface defects in 2D transition metal dichalcogenide (TMDC). This air-stable solution-based chemical treatment provides unmatched photoluminescence QY enhancement to values near 100% without changing the surface morphology. The treatment eliminates defect-mediated non-radiative recombination, which eliminates the low performance limit of TMDC and enhances its minority carrier lifetime. This novel development can address surface passivation in numerous semiconductors which will lead to highly efficient light emitting diodes, lasers and solar cells based on 2D materials.

SUGGESTED USES

- LEDs
- Lasers
- Solar Cells
- Semiconductor emitters and detectors

ADVANTAGES

- Quantum yield enhancement to near-unit values
- Surface recombination velocity reduction
- Improved Voc in solar cells
- PL peak intensity increase

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Spectral Kernel Machines With Electrically Tunable Photodetectors
- Permeable Micro-Lace Electrodes For Electrodermal Activity
- Chemical-Sensitive Field-Effect Transistor

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INVENTORS

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OTHER INFORMATION

KEYWORDS

2D, optoelectronic, semiconductor, passivation, photoluminescence quantum yield, surface defect, QY, metal dichalcogenide, TMDC

CATEGORIZED AS

- **Energy**
  - Solar
- **Materials & Chemicals**
  - Chemicals
- **Semiconductors**
  - Processing and Production

RELATED CASES

2016-079-0

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