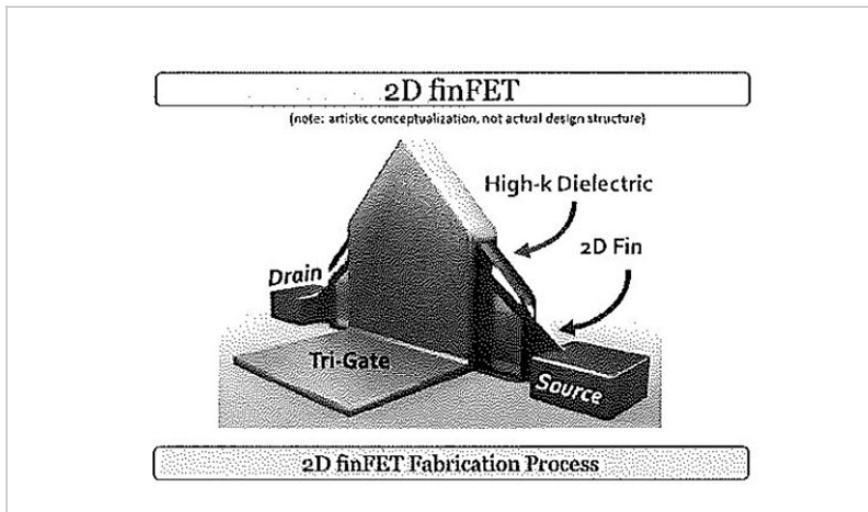


# Vertical 2D Fins for Advanced Electronics and Optoelectronics

ID# 2015-4374



2D finFET Drawing

## Technology Summary

A novel method to overcome poor device design in 2D materials by forming isolated vertical fins rather than lateral fins. The method can also control for dense crowding of the vertical structures, which would lead to unusable material. The method allows for fabrication of vertical homogenous and heterogenous two-dimensional structures perpendicular to planar structures, which are free-standing and electrically isolated. The substrates may comprise crystalline, polycrystalline or amorphous structures, such as SiC, sapphire, SiO<sub>2</sub>, graphene, graphite, poly-Si, poly-SiC and similar materials. The fabricated vertical 2D structures having a thickness < 20 layers. The researchers have also shown multilayered structures having layer thickness of less than 1nm thickness. Results have been confirmed using TEM and SEM images.

## Application & Market Utility

The disclosed invention seeks to subvert the semiconductor industry's reliance upon silicon in traditional "FinFETS". Until now, 2-dimensional materials and device designs have not been able to outperform these traditional semiconductors because below 30 nm on traditional planar FETs requires extreme fabrication techniques. Applications: 2D "fin" field effect transistors, other semiconductors, catalysis, photovoltaics. The vertical 2D structures are also suitable for coatings including but not limited to conductive, insulating and protective layers.

## Next Steps

Seeking research collaboration and licensing opportunities.

TECHNOLOGY READINESS LEVEL

4-7

### Seeking

Investment | Licensing | Research

### Keywords

- FinFET
- 2D Materials
- Semiconductor chips
- advanced electronics
- gate/channel coupling

### Researchers

#### Joshua Robinson

Associate Professor of Materials Science and Engineering

[Online Bio](#)

#### Rafael Vila

Former Undergraduate Student

### Originating College

College of Earth and Mineral Sciences

### Office of Technology Management Contact

Rokita, Joseph  
jjr152@psu.edu  
814-863-6336



Invent Penn State is a Commonwealth-wide initiative to spur economic development, job creation, and student career success. Invent Penn State blends entrepreneurship-focused academic programs, business startup training and incubation, funding for commercialization, and university-community collaborations to facilitate the challenging process of turning research discoveries into valuable products and services that can benefit Pennsylvanians and humankind. Learn more at [invent.psu.edu](http://invent.psu.edu).

Penn State is an equal opportunity, affirmative action employer, and is committed to providing employment opportunities to all qualified applicants without regard to race, color, religion, age, sex, sexual orientation, gender identity, national origin, disability or protected veteran status.