

# High Performance Perovskite Solar Cells

## Organization

University of Missouri-Kansas City

## Industry:

Renewable energy and alternate energy sources

## Researchers:

Zhonghua (Josh) Peng, PhD

## Status of Intellectual Property:

Patent pending, lab demonstrated

## Next Steps:

Produce cell in a clean room environment

For more information contact:

Jim Baxendale

Whiteboard2Boardroom

baxendalej@umkc.edu

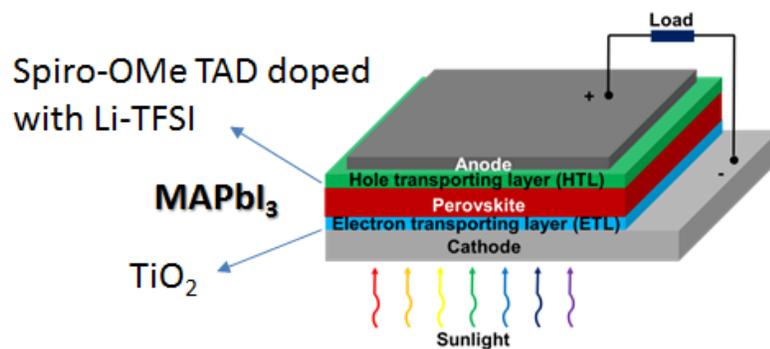


## Wanted

**Experienced leader to commercialize this hole transporting layer and possibly commercialize the resulting solar cell.**

## Customer Problem

Perovskite solar cells have surpassed traditional silicon solar cells in efficiency in a short time. Companies are not yet commercializing perovskite solar cells because of poor stability and other issues. Perovskite solar cells typically have a multi-layer structure. The current state-of-the-art HTL layer is cost prohibitive at \$300/g (shown as the HTL layer Spiro-OMe TAD doped with Li-TFSI) and hygroscopic. We need better HTL which is cheaper, better at charge conducting, more moisture resistant, and good film forming.



## Potential Market Uses

Perovskite solar cells have the same potential uses as traditional silicon cells with the added benefit of flexibility (computers, battery charging, energy conversion). Commercial use, residential use and as prices decline, personal use are all possibilities.

## Market Size:

U.S. Solar Market through 2016: Key Takeaways

**14.8 GW installed in 2016**

97% growth in Photovoltaic (PV) market over 2015

Largest year on record, surpassing 2015; Q4 2016 largest quarter on record

**Over 42 GW of total solar capacity now installed**

CAGR of 59% since 2010

**Solar top source of new electric generating capacity installed in 2016**

Represented 39% of all new electric capacity added to U.S. grid

First time solar ranks first; Natural Gas represented 29% and Wind 26%

**Solar prices dropped 29% from Q4 2015 to Q4 2016**

Prices have dropped 67% since 2011

Utility-scale PPAs now signed for \$0.03 - \$0.05/kWh

**In 2016, a new solar installation was completed every 84 seconds**

Now 1.3 million installations in the U.S.

Source: <http://www.seia.org/research-resources/solar-industry-data>

## Innovation

Researchers at UMKC have developed a HTL layer PCA-1, which has as characteristics:

- Inexpensive: <\$5/g
- Collect and transport charge fast
- Form uniform dense films
- Good moisture barrier

## Stage of Development

PCA-1 layer has been demonstrated in the lab and preliminary efficiency data has been collected. There is a need to perfect the layering in a clean room environment and demonstrate its high efficiencies and high stability in a working large area solar cell.

## Competitive Advantages

As the article cited below suggests “Perovskite solar cells are one of the most exciting green energy technologies to emerge in recent years, combining low cost with high energy conversion rates.” Researchers like Dr. Peng are striving to overcome the difficulties of the layering of the cell. Other researchers are working as well and are attempting to find lower cost layering solutions as noted below.

“Swiss Federal Institute of Technology in Lausanne (EPFL) have found a way to cut their cost even further by developing a charge-carrying material that is much cheaper, highly efficient, and could even help address the technology's current major weakness by significantly lengthening the lifespan of the panels.”

...

“The new material, dissymmetric fluorene–dithiophene (FDT), is said to cost less than one fifth to synthesize than previous compounds (US\$60 versus \$500 per gram) while still retaining a very competitive energy conversion rate of 20.2 percent.”

Source: <http://newatlas.com/cheap-durable-perovskite-solar-cells/41618/>