New Plasmonic Metamaterial Could Revolutionize Solar Cells

A recent discovery at the University of California San Diego could change the field of photonics. A team of engineers has fabricated a plasmonic metamaterial that could change the way we look at optical transmission.

The study was led by electrical engineering professor Shaya Fainman at the UC San Diego Jacobs School of Engineering, and was published in Nature Communications.

“We’re offsetting the loss introduced by the metal with gain from the semiconductor. This combination theoretically could result in zero net absorption of the signal – a lossless metamaterial,” Commented Joseph Smalley the first author of the study.

Their metamaterial works because a light emitting semiconductor replaces the lost light, though creating it is much more complex than describing it.

This plasmonic metamaterial is created by growing the crystal of a indium gallium arsenide phosphide semiconductor on a substrate. They then use plasma to etch 40-nanometer-wide trenches, that are spaced 40-nanometers apart. Then the trenches are filled, and create tiny stripes of silver and

semiconductor.

“This is the first material that behaves simultaneously as a metal and a semiconductor. If light is polarized one way, the metamaterial reflects light like a metal, and when light is polarized the other way, the metamaterial absorbs and emits light of a different ‘color’ like a semiconductor,” Smalley added.

Clearly this is an amazing new process which offers us higher efficiency optical transmission. While it is still in the laboratory phase, the manufacturing method could potentially be expanded to commercial production.