



ABOUT METAMATERIALS



Metamaterial
Technologies
Inc.

Mastering Light

THE EVOLUTION OF METAMATERIALS

LIGHT MANIPULATION BY INTELLIGENT DESIGN

Light manipulation has been around since the 19th century with the seminal work of James Clerk Maxwell and other electromagnetic scientists.

Controlling light, electricity, and magnetism have played a key role in technological advancements in our society throughout history. As industrial advancements successively become more and more dependent on the use of light, our understanding of related phenomena improves. Some of these discoveries include advances in electricity, electromagnetic technology, wireless communications, lasers, and computers. These discoveries were all made possible by challenging the understanding of how light naturally behaves, and how it is

possible to manipulate it.

Over the past 15 years, techniques for producing nanotechnology have matured, making it possible to deliver a wide range of ground-breaking applications that can control light on very small scales, also known as the near field of light. Some of the advances that have contributed to these techniques are:

- photonic crystals
- periodic nanostructures
- nanocavities
- plasmonic phenomena
- nanoparticle manipulation

From this research, a new branch of material sciences has emerged – metamaterials.



WHAT ARE METAMATERIALS?

Metamaterials are nano-composite structures made up of materials such as metals or plastics that are engineered by Metamaterial Technologies Inc. (MTI) scientists to exhibit properties that are not found in nature. A metamaterial typically consists of a multitude of structured unit cells that are comprised of multiple individual elements, which are referred to as meta-atoms. The individual elements are usually arranged in periodic patterns.

How it Works

Metamaterial research focuses on structures that produce unusual and exotic electromagnetic properties by manipulating light in ways that has never been naturally possible. Similar to the development of classical electromagnetism, metamaterial developments are expected to fundamentally alter the way the world works today.

A “metamaterial” is can be described as an assembly of multiple individual elements that are sometimes referred to as ‘meta-atoms.’ Meta-atoms are formed from conventional microscopic materials such as metals or plastics, but the materials are usually arranged in specific periodic patterns. Therefore, metamaterials gain their properties not from their composition, but from their exactly-designed structures. Their precise shape, geometry, size, orientation, and

arrangement affect the electromagnetic waves of light to create material properties that are unachievable with conventional materials. These metamaterials attain the desired effects by incorporating structural elements of sub-wavelength sizes, i.e. features that are actually smaller than the wavelength of the electromagnetic waves that they affect.

“I can’t see what exactly would happen, but I can hardly doubt that when we have some control of the arrangement of things in the small scale, we will get an enormously greater range of possible properties that substances can have.”

Richard Feynman, 1959

Metamaterials have been increasingly researched in academic environments for the past ten years. MTI is one of the first companies to move metamaterial technology from the academic community to commercialization. Metamaterial filters offer a unique light manipulation mechanism that can solve some of the world’s most challenging problems in optics. MTI is creating metamaterials for the next generation of optical devices, which includes laser protection, efficient light sources, affordable solar panels, and non-invasive medical imaging.



ABOUT US

Metamaterial Technologies Inc. (MTI) is a smart materials and photonics company that is changing the way we use, interact, and benefit from light. It specializes in metamaterial research, nanofabrication, and computational electromagnetics with access to world-class nanocomposite research. Through applied physics and intelligent design, the company is pioneering a new class of multifunctional

materials—called metamaterials—which have engineered properties that go beyond what is found in nature. MTI has developed a new platform technology that is capable of blocking, absorbing or enhancing light.

MTI is headquartered in Halifax, Nova Scotia and has offices in London, England and Pleasanton, California.

**LEARN MORE ABOUT
OUR CAPABILITIES**

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