

# The Global Market for Metamaterials and Metasurfaces 2024-2034

<https://marketpublishers.com/r/GBAAD4D3BBD1EN.html>

Date: September 2023

Pages: 205

Price: US\$ 1,250.00 (Single User License)

ID: GBAAD4D3BBD1EN

## Abstracts

Metamaterials applications will represent a multi-billion dollar market within the next decade with product advances

in radar and lidar for autonomous vehicles, telecommunications antenna, 6G networks, coatings, vibration

damping, wireless charging, noise prevention and more.

Metamaterials are artificially engineered structures with exceptional material properties (acoustic, electrical,

magnetic, optical, etc.). They comprise arrays of resonators that manipulate electromagnetic waves or sound in

ways not normally found in nature. Possessing customized dielectric properties and tunable responses they allow

for excellent flexibility in a range of applications, their use enabling the manipulation of fields and waves at a

subwavelength scale. Key applications include:

telecommunications.

acoustics.

sound insulation.

sensors.

radar imaging.

optics (terahertz and infrared).

coatings & films.

lidar systems for self-driving cars.

imaging and sensing.

power transmission.

energy harvesting.

wireless charging.

thermal management.

superlenses for medical devices

AR displays.

## Report content include

Current market analysis and future revenue forecasts, by metamaterial types, markets and region.

Commercialization assessment from research to market.

Market drivers, trends and challenges.

Competitive landscape.

In-depth opportunity assessment in markets including communications, sound

insulation, antennas,

sensors, solar coatings, displays, and medical imaging.

Profiles of 61 companies including products, investments, partnerships.  
Companies profiled include

Anywaves, Breyton, Echodyne, Inc., Evolv Technologies, Inc., Fractal Antenna Systems, Inc, Imagia,

Kymeta Corporation, Lumotive, OPT Industries, Phononic Vibes srl, Metamaterial, Inc. and Metawave

Corporation.

Detailed application market forecasts through 2034.

Regional revenues and demand analysis.

## Contents

### 1 INTRODUCTION

#### 1.1 Aims and objectives of the study

### 2 RESEARCH METHODOLOGY

### 3 EXECUTIVE SUMMARY

#### 3.1 Historical metamaterials market

#### 3.2 Recent growth

#### 3.3 Global market revenues, current and forecast

#### 3.4 Regional analysis

#### 3.5 Market opportunity assessment

#### 3.6 Investment funding in metamaterials

#### 3.7 Market and technology challenges

#### 3.8 Industry developments 2020-2023

### 4 METAMATERIALS OVERVIEW

#### 4.1 What are metamaterials?

##### 4.1.1 Electromagnetic metamaterials

##### 4.1.2 Metasurfaces

###### 4.1.2.1 Meta-Lens

###### 4.1.2.2 Metasurface holograms

###### 4.1.2.3 Invisibility cloaking and shielding

###### 4.1.2.4 Flexible metasurfaces

###### 4.1.2.5 Reconfigurable intelligent surfaces (RIS)

#### 4.2 Types of metamaterials

##### 4.2.1 Optical Metamaterials

###### 4.2.1.1 Photonic metamaterials

###### 4.2.1.2 Tunable metamaterials

###### 4.2.1.3 Frequency selective surface (FSS) based metamaterials

###### 4.2.1.4 Plasmonic metamaterials

###### 4.2.1.5 Invisibility cloaks

###### 4.2.1.6 Perfect absorbers

###### 4.2.1.7 Optical nanocircuits

- 4.2.1.8 Metalenses
- 4.2.1.9 Holograms
- 4.2.1.10 Applications
- 4.2.2 Electromagnetic metamaterials
  - 4.2.2.1 Double negative (DNG) metamaterials
  - 4.2.2.2 Single negative metamaterials
  - 4.2.2.3 Electromagnetic bandgap metamaterials (EBG)
  - 4.2.2.4 Bi-isotropic and bianisotropic metamaterials
  - 4.2.2.5 Chiral metamaterials
  - 4.2.2.6 Electromagnetic “Invisibility” cloak
- 4.2.3 Radio frequency (RF) metamaterials
  - 4.2.3.1 RF metasurfaces
  - 4.2.3.2 Frequency selective surfaces
  - 4.2.3.3 Tunable RF metamaterials
  - 4.2.3.4 RF antennas
  - 4.2.3.5 Absorbers
  - 4.2.3.6 Cloaking
  - 4.2.3.7 Luneburg lens
  - 4.2.3.8 RF filters
  - 4.2.3.9 Applications
- 4.2.4 Terahertz metamaterials
  - 4.2.4.1 THz metasurfaces
  - 4.2.4.2 Quantum metamaterials
  - 4.2.4.3 Graphene metamaterials
  - 4.2.4.4 Flexible/wearable THz metamaterials
  - 4.2.4.5 THz modulators
  - 4.2.4.6 THz switches
  - 4.2.4.7 THz absorbers
  - 4.2.4.8 THz antennas
  - 4.2.4.9 THz imaging components
- 4.2.5 Acoustic metamaterials
  - 4.2.5.1 Sonic crystals
  - 4.2.5.2 Acoustic metasurfaces
  - 4.2.5.3 Locally resonant materials
  - 4.2.5.4 Acoustic cloaks
  - 4.2.5.5 Hyperlenses
  - 4.2.5.6 Sonic one-way sheets
  - 4.2.5.7 Acoustic diodes
  - 4.2.5.8 Acoustic absorbers

- 4.2.5.9 Applications
- 4.2.6 Tunable Metamaterials
  - 4.2.6.1 Tunable electromagnetic metamaterials
  - 4.2.6.2 Tunable THz metamaterials
  - 4.2.6.3 Tunable acoustic metamaterials
  - 4.2.6.4 Tunable optical metamaterials
  - 4.2.6.5 Applications
- 4.2.7 Nonlinear metamaterials
- 4.2.8 Self-Transforming Metamaterials
- 4.2.9 Quantum Metamaterials
- 4.2.10 Topological Metamaterials
- 4.2.11 Graphene in metamaterials applications
- 4.3 Technology Readiness Level (TRL)

## **5 MARKETS AND APPLICATIONS FOR METAMATERIALS**

- 5.1 Competitive landscape
- 5.2 SWOT analysis
- 5.3 Future market outlook
- 5.4 Global revenues for metamaterials, by market, 2017-2034 (Millions USD).
  - 5.4.1 By metamaterial type
  - 5.4.2 By end use market
  - 5.4.3 By region
- 5.5 ACOUSTICS
  - 5.5.1 Market drivers and trends
  - 5.5.2 Applications
    - 5.5.2.1 Sound insulation
    - 5.5.2.2 Vibration dampers
  - 5.5.3 Market assessment
  - 5.5.4 Global revenues 2017-2034
- 5.6 COMMUNICATIONS
  - 5.6.1 Market drivers and trends
  - 5.6.2 Applications
    - 5.6.2.1 Wireless Networks
    - 5.6.2.2 Fiber Optic Communications
    - 5.6.2.3 Satellite Communications
    - 5.6.2.4 Thermal management
  - 5.6.3 Global revenues 2017-2034
- 5.7 AUTOMOTIVE

- 5.7.1 Market drivers and trends
- 5.7.2 Applications
  - 5.7.2.1 Radar and sensors
  - 5.7.2.2 Autonomous vehicles
  - 5.7.2.3 Anti-reflective plastics
- 5.7.3 Market assessment
- 5.7.4 Global revenues 2017-2034
- 5.8 AEROSPACE, DEFENCE & SECURITY
  - 5.8.1 Market drivers and trends
  - 5.8.2 Applications
    - 5.8.2.1 Stealth technology
    - 5.8.2.2 Radar
    - 5.8.2.3 Optical sensors
    - 5.8.2.4 Security screening
    - 5.8.2.5 Composites
    - 5.8.2.6 Windscreen films
    - 5.8.2.7 Protective eyewear for pilots
    - 5.8.2.8 Electromagnetic shielding
    - 5.8.2.9 Thermal management
  - 5.8.3 Market assessment
  - 5.8.4 Global revenues 2017-2034
- 5.9 COATINGS AND FILMS
  - 5.9.1 Market drivers and trends
  - 5.9.2 Applications
    - 5.9.2.1 Cooling films
    - 5.9.2.2 Anti-reflection surfaces
    - 5.9.2.3 Optical solar reflection coatings
  - 5.9.3 Market assessment
  - 5.9.4 Global revenues 2017-2034
- 5.10 SOLAR
  - 5.10.1 Market drivers and trends
  - 5.10.2 Applications
    - 5.10.2.1 Solar-thermal absorber
    - 5.10.2.2 Coatings
  - 5.10.3 Global revenues 2017-2034
- 5.11 MEDICAL IMAGING
  - 5.11.1 Market drivers and trends
  - 5.11.2 Applications
    - 5.11.2.1 MRI imaging

5.11.3 Global revenues 2017-2034

## 5.12 DISPLAYS

5.12.1 Market drivers and trends

5.12.2 Applications

5.12.2.1 Holographic displays

5.12.2.2 Wearable displays

5.12.2.3 Multiview displays

5.12.2.4 Superlenses for cameras, smartphones and VR headsets

**139**

5.12.2.5 Stretchable displays

5.12.2.6 Soft materials

5.12.2.7 Anti-reflection coatings

## **6 COMPANY PROFILES 143 (61 COMPANY PROFILES)**

## **7 REFERENCES**



## List Of Tables

### LIST OF TABLES

Table 1. Market summary for metamaterials.

Table 2. Global revenues for metamaterials and metasurfaces, total, 2017-2034 (Millions USD),  
Conservative estimate.

Table 3. Global revenues for metamaterials and metasurfaces, by region, 2017-2034 (Millions USD).

Table 4. Market opportunity assessment matrix for metamaterials and metasurfaces applications.

Table 5. Investment funding in metamaterials and metasurfaces companies.

Table 6. Market and technology challenges in metamaterials and metasurfaces.

Table 7. Metamaterials and metasurfaces industry developments 2020-2023.

Table 8. Comparison of types of metamaterials-frequency ranges, key characteristics, and applications.

Table 9. Technology Readiness Level (TRL) Examples.

Table 10. Global revenues for metamaterials, by metamaterial type, 2017-2034 (Millions USD).

Table 11. Global revenues for metamaterials, by market, 2017-2034 (Millions USD).

Table 12. Global revenues for metamaterials, by region, 2017-2034 (Millions USD).

Table 13. Metamaterials and metasurfaces in sound insulation-market drivers and trends.

Table 14. Market assessment for metamaterials and metasurfaces in acoustics.

Table 15. Market opportunity assessment for metamaterials in acoustics.

Table 16. Global revenues for metamaterials and metasurfaces in acoustics, 2017-2034 (Millions USD).

Table 17: Metamaterials and metasurfaces in electronics and communications-market drivers and trends.

Table 18. Unmet need, metamaterial solution and markets.

Table 19. Market opportunity assessment for metamaterials and metasurfaces in communications.

Table 20. Global revenues for metamaterials and metasurfaces in communications, 2017-2034

(Millions USD).

Table 21. Metamaterials and metasurfaces in the automotive sector-market drivers and trends.

Table 22. Market assessment for metamaterials and metasurfaces in automotive.

Table 23. Market opportunity assessment for metamaterials and metasurfaces in automotive.

Table 24. Global revenues for metamaterials and metasurfaces in automotive, 2017-2034 (Millions USD).

Table 25. Metamaterials and metasurfaces in aerospace, defence and security-market drivers and trends.

Table 26. Market assessment for metamaterials and metasurfaces in aerospace, defence & security.

Table 27. Market opportunity assessment for metamaterials and metasurfaces in aerospace, defence & security.

Table 28. Global revenues for metamaterials in aerospace, defence & security, 2017-2034 (Millions USD).

Table 29. Metamaterials in coatings and films-market drivers and trends.

Table 30. Market assessment for metamaterials and metasurfaces in coatings and films.

Table 31. Market opportunity assessment for metamaterials and metasurfaces in coatings and films.

Table 32. Global revenues for metamaterials and metasurfaces in coatings and films, 2017-2034 (Millions USD).

Table 33. Metamaterials and metasurfaces in solar-market drivers and trends.

Table 34. Global revenues for metamaterials and metasurfaces in solar, 2017-2034 (Millions USD).

Table 35. Metamaterials and metasurfaces in medical imaging-drivers and trends.

Table 36. Global revenues for metamaterials and metasurfaces in medical imaging, 2017-2034 (Millions USD).

Table 37. Metamaterials and metasurfaces in touch screens and displays-drivers and trends.



## List Of Figures

### LIST OF FIGURES

- Figure 1. Classification of metamaterials based on functionalities.
- Figure 2. Global revenues for metamaterials and metasurfaces, total, 2017-2034 (Millions USD).
- Figure 3. Global revenues for metamaterials and metasurfaces, by market, 2017-2034 (Millions USD).
- Figure 4. Global revenues for metamaterials and metasurfaces, by region, 2017-2034 (Millions USD).
- Figure 5. Metamaterials example structures.
- Figure 6. Metamaterial schematic versus conventional materials.
- Figure 7. Scanning electron microscope (SEM) images of several metalens antenna forms.

### 37

- Figure 8. Transparent and flexible metamaterial film developed by Sekishi Chemical.
- Figure 9. Electromagnetic metamaterial.
- Figure 10. Schematic of Electromagnetic Band Gap (EBG) structure.
- Figure 11. Schematic of chiral metamaterials.
- Figure 12. Terahertz metamaterials.
- Figure 13. Nonlinear metamaterials- 400-nm thick nonlinear mirror that reflects frequency-doubled output using input light intensity as small as that of a laser pointer.
- Figure 14. Properties and applications of graphene metamaterials.
- Figure 15. Technology Readiness Level (TRL) for metamaterials and metasurfaces.
- Figure 16. SWOT analysis: metamaterials market.
- Figure 17. Global revenues for metamaterials, by metamaterial type, 2017-2034 (Millions USD).
- Figure 18. Global revenues for metamaterials, by market, 2017-2034 (Millions USD).
- Figure 19. Global revenues for metamaterials, by region, 2017-2034 (Millions USD).
- Figure

## I would like to order

Product name: The Global Market for Metamaterials and Metasurfaces 2024-2034

Product link: <https://marketpublishers.com/r/GBAAD4D3BBD1EN.html>

Price: US\$ 1,250.00 (Single User License / Electronic Delivery)

If you want to order Corporate License or Hard Copy, please, contact our Customer Service:

[info@marketpublishers.com](mailto:info@marketpublishers.com)

## Payment

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page <https://marketpublishers.com/r/GBAAD4D3BBD1EN.html>

To pay by Wire Transfer, please, fill in your contact details in the form below:

First name:  
Last name:  
Email:  
Company:  
Address:  
City:  
Zip code:  
Country:  
Tel:  
Fax:  
Your message:

**\*\*All fields are required**

Customer signature \_\_\_\_\_

Please, note that by ordering from marketpublishers.com you are agreeing to our Terms & Conditions at <https://marketpublishers.com/docs/terms.html>

To place an order via fax simply print this form, fill in the information below and fax the completed form to +44 20 7900 3970