

MC²

Metal Clad Composite

Description

MC² (Metal Clad Composite) marries two technologies to give you metal performance without machining. This process combines the high strength physical properties of NanoTool™ stereolithography material with nickel plating technology resulting in significantly enhanced physical properties for low volume production.

The core of MC² technology utilizes Stereolithography (SL) parts made from **DSM Somos NanoTool** which offers a high strength through nanoparticle technology. After SL parts are made from NanoTool, a greatly stiffened composite is produced by the plating expertise of RePliForm. The MC² process opens the use of SL produced NanoTool parts for the medical, aerospace and automotive industries for a number of new application areas such as:

- Structural (approaches the strength of die cast metal)**
- EMI Shielding**
- Decorative**
- Barrier**
- Thermal**
- Abrasion Resistance**

Metal Parts Without Machining

| Application | Metal Content |
|---|--|
| Structural | Mg 18% coating Al 25% coating Zn 30% Coating |
| •Replacement of die cast parts (wall thicknesses <0.060") | |
| •Mimic sheet metal parts | 30+% coating |
| ESD, RFI, EMI Electronics and medical devices | Up to 0.002" |
| Decorative | At least 0.005" |
| Barrier | At least 0.002" |
| Thermal | At least 0.003" |

MC² Certified service providers will be able to provide the engineering assistance in determining if a project is a good candidate for this technology.

Application

Structural (.002"-.008") – MC² offers the structural strength needed to withstand the rigors of functional testing applications. Prototypes used in aggressive functional applications typically made from die casting or CNC machining methods, can now be manufactured faster and often times more cost effectively from the MC² process. Three levels of plating thicknesses are offered, Type 1 (6% Metal), Type 2 (12% Metal), and Type 3 (24% Metal).



Above: Pitney Bowes Project
Read more at repliforminc.com

Physical properties are listed under the "**Mechanical properties**" section.

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Application (continued)

Barrier (.002”-.003”)

– Since MC² incorporates an exterior Nickel coating, parts made with this technology are impervious to environments which would deteriorate typical SL materials. This quality is especially beneficial for applications requiring exposure to water, solvents, cleaners, and automotive fluids. In addition, MC² performs well in humid air conditions where conventional SL materials tend to show changes in physical properties.



Above: Water tank component
Read more at repliforvinc.com

Electromagnetic Shielding (.001”-.002”)

– Copper and nickel-plating on plastic parts is a common method used to control electromagnetic interference, radio frequency interference and static discharge problems with plastic components. The thick (by normal plating standards) metal plated MC² parts can be very effective in these applications.



Above: A copper and nickel coated part in the foreground along with an anodized aluminum piece in the background

Decorative (.005”+) - MC² is offered in a number of decorative surface finishes to fit most aesthetic needs.

Finishes – Nickel or Copper



- Polished
- Fine Brushed
- Course Brushed
- 2mil Standard
- 6mil Standard
- Semi bright copper topped with Nickel

Also, custom finishes are available.

Thermal (.003”+) – The combination of temperature resistant materials used in the MC² process makes it an excellent choice for high temperature applications. In addition, the metal coating gives flame retardant qualities to the MC² part.

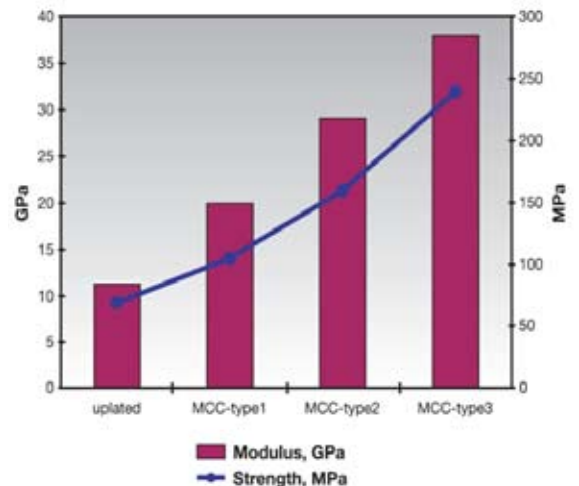
Abrasion Resistance (.002”+) – The metal coating makes MC² well suited for applications which require abrasion resistance such as gears for cams in mechanical processes.

Mechanical properties

Physical property data has been generated for MC² at three plating thicknesses to provide engineers with important information when considering MC² for specific applications:

- Type 1 – 6% plating thickness**
- Type 2 – 12% plating thickness**
- Type 3 – 24% plating thickness**

Tensile Strength and Tensile Modulus Values Versus Unplated NanoTool for Three MC² Construction Types

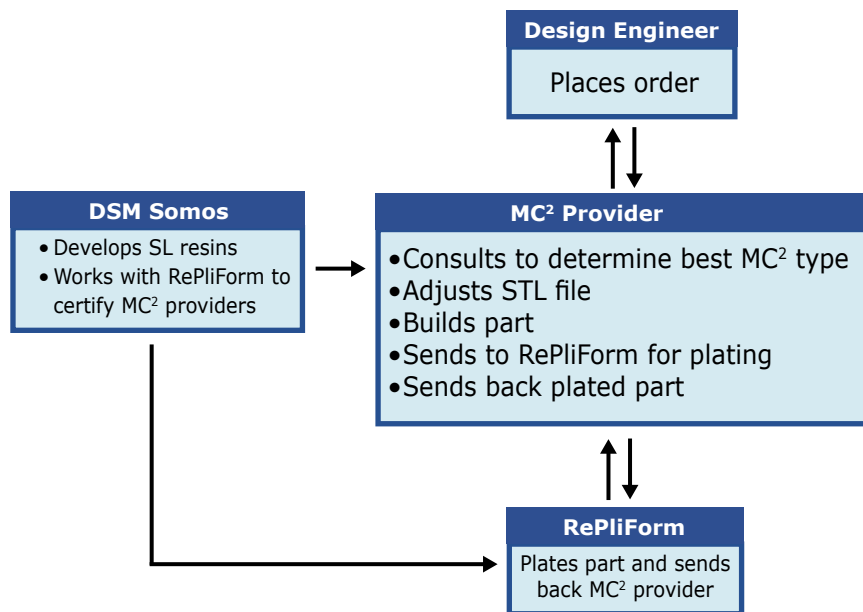


Metal parts without machining

Tensile strength values of three MC² construction types and various alloys

| MC2 Type | Type 1 | Type 2 | Type 3 |
|-----------------------|--------|---------|---------|
| Tensile Strength, MPa | 105 | 160 | 240 |
| Molded FRP | 70-140 | | |
| Al Alloys | | | 230-570 |
| Mg Alloys | | 152-379 | |
| Cu Alloys | | 172-220 | |
| Zn Alloys | | | 300-460 |

How to use an MC² provider: The MC² Relationship and Process



MC² consultation includes

1. How to meet tight fitting tolerances
2. How to design parts specifically for the MC² process, such as the need to avoid a sharp radius on inside corners
3. Which type of MC² coating to use based on needs for tensile strength, wall thickness and even budget requirements
4. How to overcome problems when it appears the design and material properties are in conflict

For more information please contact your nearest MC² service provider, DSM Somos, or RePliForm Inc.

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