

# CeraFuse™ Ceramic Restructuring

*Ceramic Coated Magnesium Improves Component Performance*

## Introduction

**CeraFuse™** is a hard, dense ceramic surface that can be created on magnesium substrates providing corrosion and wear resistance as well as an excellent base for the application of paint or lacquers.

Since the magnesium is restructured as opposed to mechanically coated, it will not delaminate. The work piece exhibits only minimal dimensional change (approximately 25% of the ceramic layer thickness).

A typical anodized magnesium coating is no more than 25 microns thick. By comparison, the **CeraFuse™** ceramic can reach a thickness of 60 microns.

The hardness of the ceramic layer varies only slightly with the alloy being processed. Coatings on are consistently in the range of 400 to 600  $\text{Kn}_{100}$ .

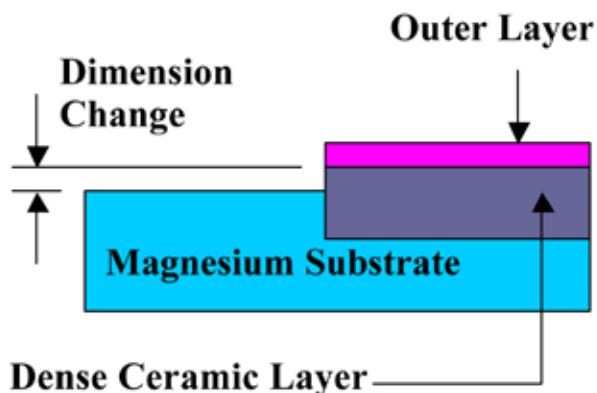
**CeraFuse™** restructuring of light weight, high strength magnesium provides an attractive alternative to more expensive materials.

## The CeraFuse™ Process

Micro-arc oxidization technology (MAO) was developed in Russia nearly thirty-five years ago and is an offshoot of DC anodizing. MAO creates a plasma discharge between the magnesium substrate and the electrolyte. Even though local temperatures are very high, the substrates are maintained below 60°C.

As the process initiates, a granular layer forms on the surface. As it continues, a hard, dense inner layer of magnesium oxides transitions inward.

## Typical Microarc Ceramic Surface



For some applications, buffing, tumbling or other means are used to remove the outer surface before the parts are put into service. Surface finishes as low as 16 Ra can be achieved with diamond lapping or honing techniques.

**CeraFuse™** provide a superb surface for subsequent application of polymeric coatings, paints and lacquers. The electrolyte utilized in the process is environmentally benign. A 10 –25  $\mu$  coating offers a scratch resistant surface that is in itself and excellent corrosion inhibitor.

## Improved Component Performance

**CeraFuse™** coated magnesium, alloys exhibit improved wear resistance for sliding elements, pistons and pump components.

Very thin cast alloy sections are stiffened by the application of **CeraFuse™** coatings.

**CeraFuse™** is utilized as a preparatory coating for paint and lacquers on cell phone, eye glass frames, lap-top computer cases, medical instruments, gearboxes, transmission housings and other similar components.

## Whyco Finishing Technologies, LLC

Whyco Finishing Technologies, LLC is a leader in micro-arc oxidization technology and is equipped to process a wide variety of components in our state-of-the-art facility.

We are dedicated to customer satisfaction and in meeting ever-changing surface engineering requirements, including developing the ability to resurface magnesium and other alloys.

Whyco's design, manufacturing and quality assurance systems are based on conformance to both QS 9000 and military standards.

For more information and assistance with your application, contact us at: (860)-283-5826

Visit our Website: [www.whyco.com](http://www.whyco.com)

# CeraFuse™ Characteristics Magnesium Substrate

<b>Hardness</b>	Alloy - AZ91D
<b>CeraFuse™</b>	400 – 600 Kn <sub>100</sub>

<b>Corrosion Resistance</b>			
ASTM B117-97	Time to white corrosion products	ASTM D 1654-92	Rating
<b>CeraFuse™</b> 40u coating	800 – 1000 hours	<b>CeraFuse™</b> 40u coating	9 (per procedure B)

<b>Taber Abraser Test – Wear Resistance</b>					
Method	Alloy	Wear Index (mg/1000 cycles)	Wear Index (30k Cycles)	Wear Index (40k Cycles)	Wear Index (50k Cycles)
AMS 2466	AZ31B-H24	10.9 – 12.9	2.38 mg	1.95 mg	1.70 mg
MIL-A-8625F	AZ31B-H24	4.7 – 5.5	2.44 mg	1.85 mg	1.77 mg

AMS 2466 specifies a wear rate of 30 mg/1000 cycles for anodic coatings on magnesium. It is evident that the inner layer of the **CeraFuse™** coating wears at a considerably lower rate than the outer, more granular layer.

<b>Other Properties</b>			
Coefficient of Friction	Dielectric Strength	Uniformity	Thermal Properties
0.15 vs steel (coating polished)	Withstands up to 100 V DC Depending on coating thickness	Thickness range is 10 to 60u Controllable within 10% of total thickness	Good thermal barrier and/or thermal protection