

SURFACE COATINGS FOR MOLDMAX® FAMILY OF ALLOYS

Brush Wellman's MoldMAX® family of copper based alloys are processed to provide an optimal combination of hardness and thermal conductivity for a variety of injection and blow mold tooling applications. MoldMAX® is available in several different hardness ranges, each with its own level of thermal conductivity. MoldMAX can be supplied with a typical maximum hardness of HRC 40. Maximizing the thermal conductivity of the molding system will decrease cycle times and achieve maximum productivity from your tooling. MoldMAX often has sufficient surface hardness to resist wear and abrasion caused by the injected resin or the mold parting line. In high wear applications, such as when using glass filled resins or in a high contact shut-off area, a mold coating may be recommended to increase wear resistance and enhance the service life of the mold.

Coatings can be used to enhance the surface characteristics of injection or blow mold tooling used in the plastics industry. Mold coatings can be used to improve wear resistance, corrosion resistance, mold release and repair/recoating to extend service life. Understanding the molding parameters will influence the decision whether to coat the mold and the type of coating to be used.

COATING METHODS

There are several coating methods applicable when talking about MoldMAX alloys. One of the main concerns when considering a coating process is its application temperature. Elevated temperatures can soften most mold materials. In all cases, proper cleaning of the mold component prior to coating is one of the main factors that influence coating adhesion and quality. The coatings used for copper based alloys

are typically applied using one of the following methods:

- **Electroplating**
- **Electroless Plating**
- **Physical Vapor Deposition (PVD)**

Electroplating is one of the most generally used and most traditional coating method.

Electroless plating involves a chemical reduction process whereby any catalytic surface in contact with the plating solution is coated uniformly regardless of part geometry. There is no electrical current involved. Nickel plating is the most commonly performed electroless process. An advantage of electroless plating is that its thickness depends solely on the deposition rate and the immersion time, not on current density. These coatings can also be co-deposited, typically with Teflon® (PFTE), for a coating with a low friction coefficient.

Mold Coatings Recommended for MoldMax® Alloys

Coating Type	Deposition Process	Typical Thickness (Inches)	Typical Coating Hardness	Application	
Armoly® (Thin, Dense Chrome)*	Electrolytic	0.0001-0.0003	HRC 72	<140F	silvery matte
Armoly XADC®*	Electrolytic	0.0001-0.0003	HRC 90		
Chrome - Standard Hard	Electrolytic	.0001-.0005"	HRC 68	130-140F	
Nickel - Electroless	Electroless	0.0005"-.001"	HRC 50 (as plated)	180F	silver
Nickel/Teflon®† - Electroless	Electroless	0.0005"	HRC 50, baked-HRC 70	<100F baked @ up to 750F	silver
Nickel - Electrolytic (Engineering)	Electrolytic		HRC 50		
Titanium Nitride (TiN)	PVD	0.0001-0.0002"	HRC 82	950F	gold
Titanium Carbonitride (TiCN)	PVD	1-4 um	HRC 92		blue-gray
Chromium Carbide (CrC)	PVD	1-6+ um	HRC 70		silver-gray
Chromium Nitride (CrN)	PVD	1-6 um	HRC 68		
Diamond Black (Boron Carbide)	PVD	0.00008"	HRC 93	<250F	dark gray
Diamond Like Carbon (DLC)	PVD	1-2 um	HRC 90+	200F	black-gray

* Armoly and Armoly XADC are registered trademarks of The Armoly Corporation.

† Teflon is a registered trademark of E. I. du Pont de Nemours and Company.

Physical Vapor Deposition (PVD) coatings are applied in a vacuum chamber by vaporizing the coating material and accelerating it towards the part.

COATING PARAMETERS FOR MOLDMAX

As mentioned, when preparing a part for coating, the surface of the part must be clean and free of oxidation. This means the part will typically be degreased and dipped in an acid solution to remove oxidation. All copper-based alloys will have a natural copper oxide on their surfaces

that must be removed for good coating adhesion. Since most metals will soften when exposed to elevated temperatures, it is also important to limit the temperatures used in the coating process. (Process temperatures above 550°F for MoldMAX (850°F for MoldMAX SC) should be avoided unless some degree of softening of the base material can be tolerated. Short time exposures to higher temperatures may be acceptable depending on the application. To avoid degradation of the mold material, it is paramount to discuss these details with your coating supplier.

COATING TYPES

The chart shown on front contains a description of the types of coating that can be used with MoldMAX tooling to enhance the performance of your mold. There is normally no one correct coating to recommend for a given application, as there are performance trade-offs with each of them.

For an in-depth Tech Brief on coating MoldMAX, email:

alloypromotions@brushwellman.com

SAFE HANDLING OF COPPER BERYLLIUM

Copper beryllium, like many industrial materials, poses a health risk only if mishandled. In its usual solid form, as well as for finished parts, and in most manufacturing operations, it is completely safe. However, breathing very fine particles, may cause a serious lung condition in a small percentage of individuals. Risk can be minimized with simple, proven, and readily available engineering controls such as ventilation of operations producing fine dust. Information on safe handling procedures is available from Brush Wellman Inc.

FOR ADDITIONAL INFORMATION

For further information or technical assistance, contact Brush Wellman's Customer Technical Service Department in Cleveland, Ohio at alloy_tech_svc@brushwellman.com or (800) 375-4205. Visit www.MoldMAX.com to learn about our full line of MoldMAX mold & tooling alloys

Brush Wellman's MoldMAX family of mold and tooling alloys now consists of:

MoldMAX HH® Alloy:

Copper Beryllium
Typical Applications: Injection & blow molds

MoldMAX LH® Alloy:

Copper Beryllium
Typical Applications: Injection & blow molds

MoldMAX XL® Alloy:

Copper Nickel Tin
Typical Applications: Injection molds

MoldMAX SC Alloy:

Copper Beryllium
Typical Applications: Injection & blow molds, hot runner systems

NEW MoldMAX V® Alloy:

Copper Nickel Silicon Chrome
Typical Applications: Injection & blow molds

Visit www.MoldMAX.com to learn about our full line of MoldMAX mold & tooling alloys.

Please Note Our Address Change - beginning **Monday, December 8th, 2008** our new address will be:

**6070 Parkland Blvd.
Mayfield Hts., Ohio 44124**

MoldMAX PRODUCT BROCHURE

HOT OFF THE PRESSES

Brush has recently published a new MoldMAX product brochure complete with datasheets and case histories detailing each of the MoldMAX alloys available.



Contact us to request your copy:

alloypromotions@brushwellman.com



Visit Brushwellman.com and click on our newsletter banner to submit your email address and have this newsletter delivered quarterly to your inbox.

Events

February 10-12, 2009:

Plastec West, Anaheim, CA—

Visit Brush Wellman at booth 3811

June 22-26, 2009:

NPE, Chicago, IL—

Visit Brush Wellman at booth 130032

Contact us at alloypromotions@brushwellman.com to inquire about complimentary passes to any of our shows.

MoldMAX® - Mold Alloys

Providing Thermal Management Solutions

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