



Greenkote®
thermal diffusion metal coating



*The smarter alternative
to zinc plating, hot-dip
galvanizing, sherardizing
and metal flake coating –*

*Higher-performing
and also eco-friendly!*



Galvanizing—or zinc coating—has been used for over a hundred years to protect iron-based metals from the ravages of corrosion. Greenkote is an advanced, patented process that takes zinc-based metal coating to a whole new level of performance.

A multi-functional thermal diffusion coating, Greenkote serves many applications in construction, automotive, oil & gas, mining, aerospace, utilities, bridges, wind, solar, defense, marine and numerous other industries—all around the world.



Greenkote[®] *thermal diffusion metal coating*

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This is a unique zinc-based corrosion-blocking coating that eliminates hydrogen embrittlement, has better adhesion, wears longer, saves money –

And, it's eco-friendly!

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A higher-performance coating

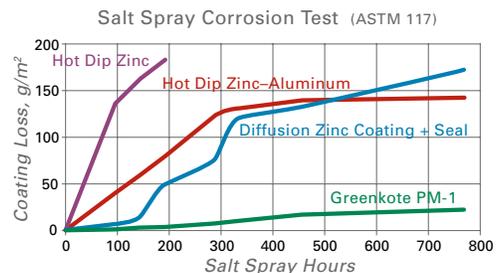
Greenkote is an advanced multi-functional coating that is widely chosen for its exceptional corrosion protection, longer wear and higher performance.

It outperforms many traditional coating processes such as zinc plating, hot dip, metal flake and sherardizing as well as PVD and CVD. In many applications it can replace chromium, vanadium and titanium coatings. For some uses, Greenkote-treated carbon steel can even replace stainless steel.

Unexcelled corrosion resistance



Greenkote provides exceptionally high corrosion resistance for longer periods of time — both at low and high temperatures, giving high-quality corrosion protection up to 650°C. In corrosion-resistance tests, Greenkote-coated bolts outperform other zinc coatings by a significant margin.



Uniform and conformal coating



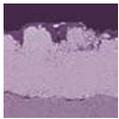
Greenkote provides greater uniformity and conformality of coverage than most other competitive coatings. This includes both ID and OD coverage, blind holes, threads, fillets and sharp corners, which are challenging for many coating technologies. Greenkote offers a wide range of coating thicknesses,





from 100 µm down to 5 µm, to further enhance its conformality on very small features.

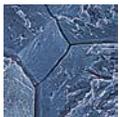
Metallurgical bonding, weldability



Greenkote coatings are literally diffused into the surface of the part. Integrally adhered in this way, Greenkote provides an extremely strong and permanent metallurgical bond. So, unlike many other coatings, it will not delaminate, and it is highly resistant to chipping and similar types of damage. Greenkote can also stand up to crimping, bending and other follow-up processing.

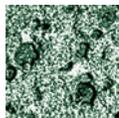
Notably, Greenkote coatings are also weldable in certain applications. The fully-alloyed intermetallic structure of Greenkote gives it superior weldability compared with pure zinc coatings.

Elimination of hydrogen embrittlement



When metals such as steel are exposed to hydrogen, the hydrogen atoms can diffuse into the metal, ultimately creating internal pressures, causing the metal to become brittle and fracture. Some coating processes such as electroplating commonly cause hydrogen embrittlement; but Greenkote does not. Because it involves no sources of hydrogen, Greenkote totally eliminates hydrogen embrittlement as a potential coating problem, making it an excellent choice for coating high-strength steels.

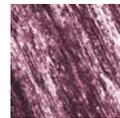
Superior adhesion



The unique micro-roughness of Greenkote's surface naturally improves the adhesion of top-coat layers when it is used in primer or adhesive bonding applications. It eliminates the need for surface

roughening or other surface preparation. Greenkote is particularly well suited to one- and two-coat adhesive products used for molded rubber compounds of natural and synthetic elastomers because these materials will bond directly to the Greenkote surface.

Greater hardness, longer wear



Compared with zinc plating and hot-dip, Greenkote has greater hardness (up to HV 450–550). This, combined with its reduced friction, gives Greenkote greater durability, longer wear and greater resistance to galling and seizing.

Many cost efficiencies



Greenkote's superior corrosion resistance allows thinner coatings to be used, and superior conformal coverage minimizes the need for rework.

Also, the unique bonding-ready Greenkote surface eliminates the expense of additional surface prep, whether for a simple phosphate or a durable functional topcoat. Greenkote processing equipment is relatively low cost and does not require significant floor space. Plus, eco-friendliness eliminates the costs of hazardous-chemical monitoring and remediation.

In addition — it's uniquely eco-friendly!



Greenkote coating is unique in combining high performance, cost efficiency — and eco friendliness! Unlike many competitive processes, Greenkote uses

no hazardous materials or heavy metals, generates no toxic wastes and is completely benign to the environment. This is why it complies with the most strict environmental standards and regulations in numerous industries around the world.



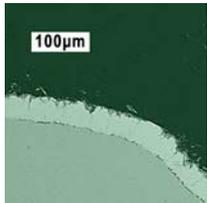
Greenkote meets the strictest environmental regulations and the standards of many international organizations.





Your choice of Greenkote coatings

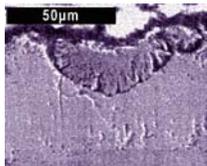
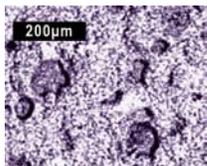
Greenkote offers a choice of two metal coating families — PM-1 and PM-10 — to provide a range of thickness, hardness and other characteristics. Within each family the specifications may be varied to tailor the coating and to address specific applications, topcoats or other requirements.



SEM cross section of Greenkote PM-10 illustrating conformal coating capabilities

PM-1 for thicker coatings: 15-100 µm

Greenkote PM-1 is a thermal diffusion sacrificial corrosion-resistant coating of Zn-Al polymetallic composition. Its thickness can be adjusted from 15 to 100 µm. PM-1 is well suited for marine, industrial, and other challenging environments that require superior long-term corrosion resistance combined with excellent torque lubricity and torque retention. PM-1 provides superior surface hardness, to HV 400-450. And for additional hardness, to HV 550, Greenkote also offers the PM-1H process.



SEM top and side views of the surface inclusions that give Greenkote its unique strong adhesion to topcoats and rubber-to-metal molding

PM-1 coating provides resistance to damage during crimping and bending operations as well as low friction and resistance to seizing and galling. In certain applications, Greenkote can be welded with minimal adjustment to welding parameters.

This coating is ideal for carbon and low-alloy steels and cast irons, and it can even be considered as a replacement for stainless steel. It can also be used for sintered and MIM parts.

PM-1 is compatible with many standard top coat layers and friction modifiers for the most demanding fastener applications. It is also effective for coating inside threads as well as washers.

PM-10 for thinner coatings: 5-15 µm

The Greenkote PM-10 family also has zinc-aluminum composition and is recommended for stamped parts and fasteners. PM-10 coatings are particularly useful for fine-featured parts and as base layers to increase corrosion protection and enhance other performance.

Often, they are used with topcoats, friction modifiers or sealers.

These thinner coatings (5–15µm) work well for small, fine-threaded fasteners with standard and high-strength specifications. PM-10 provides uniform coating thickness on challenging part geometries, good surface hardness (up to HV 400), uniform tightening torque, resistance to damage during crimping operations and long-term corrosion protection.

Greenkote: an ideal base for duplex coatings

To enhance or modify coating performance or to change appearance or color, it may be useful to add an additional coating on top of Greenkote. These multi-layer coatings are known as “duplex systems.”

The unique microroughness of the Greenkote surface provides optimum adhesion for a broad range of topcoats. Unlike other anti-corrosion coatings such as galvanizing, Greenkote requires no primer or special surface finishing before adding a topcoat. No phosphate pretreatment or abrasive cleaning is needed on non-heat treated metal substrates. Greenkote provides excellent under-bond corrosion protection and undercut resistance.

Many automotive applications such as lock parts use Greenkote duplex coatings. Greenkote PM-10 coating paired with e-coat offers a number of synergies and is a strong replacement for zinc-nickel plating with e-coat.

Serving your coating needs

Greenkote serves its customers through a network of sales offices, coating facilities and licensed partner operations around the world. For additional information about our coating technology, coating services or becoming a licensee, please visit our website or contact us directly.



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