

Retaining Corrosion Resistance in Stainless Steels with S-phase Nitriding

By Edward Rolinski, Senior Scientist, Advanced Heat Treat Corp.



UltraGlow® Ion (Plasma) Nitriding

Since plasma is very effective in removing the passive layer of a chromium oxide formed naturally on the surface of stainless steel, UltraGlow® Ion (Plasma) Nitriding is widely used to harden (especially selective harden) stainless steel parts.

About the Author

Dr. Edward Rolinski (aka Dr. Glow) graduated from the Warsaw University of Technology Department of Mechanical Manufacturing Engineering with a Master of Science and specialization in the Physical Metallurgy and Heat Treatment of Metals. He received his Doctorate of Philosophy in 1978 and Doctor of Science degree in 1989. Dr. Glow started with Advanced Heat Treat Corp. in February of 1994 and currently holds the position of Senior Scientist. He has published over 50 scientific and technical papers and has coauthored three books. Dr. Glow has also been a speaker at numerous technical conferences, presenting on the benefits and uses of ion/plasma nitriding and has given technical presentations to engineering departments at numerous companies throughout the United States.



Edward Rolinski
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Advanced Heat Treat Corp. has been providing solutions for customers that need to retain the corrosion resistance in their stainless steels by using UltraGlow® technology for numerous years. This is now a very well-developed process that can be carried out by either carburizing or nitriding; such processes produce a so-called “S-phase.”

For instance, a stainless steel component made of austenitic stainless steel such as 304 or 316, UltraGlow® Nitriding will saturate the surface of the component of the steel with nitrogen or both carbon and nitrogen and then form an expanded (S-phase) layer.

When austenite is saturated with a significant amount of nitrogen or carbon, which expand its lattice, the S-layer forms. The layer of this type can be formed in stainless steel such as 304, 316, 2205 and others. The S-phase layer has enhanced corrosion resistance. It is approximately 10-15 micrometers thick (or 0.0004-0.0006 inches) and is extremely hard (more than 1000 Vickers).

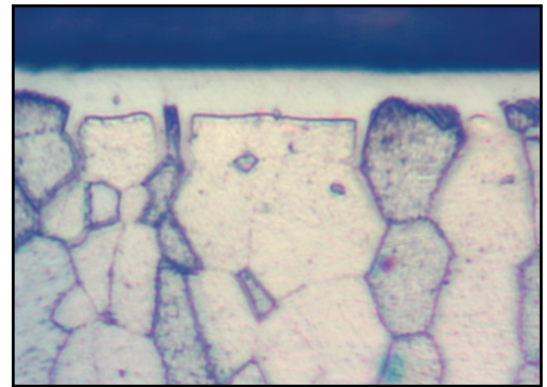


Photo micrograph of 2205 duplex SS showing the S-phase formed during combined carburizing/nitriding cycle.

This layer is resistant to corrosion in many environments. It is also resistant to cavitation and erosion, as well as to the tribological/corrosive interactions. Oil, gas and/or marine industries find this surface treatment extremely beneficial as it assists in the prevention of corrosion. Visit www.ahtweb.com or call 319.232.5221 to learn more about surface treatment solutions for your stainless steel applications and other benefits of UltraGlow® Ion and Gas Nitriding. If you'd like to submit a technical question to Dr. Glow, e-mail doctorglow@ion-nitriding.com.



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