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The Recent State of Plasma Diffusion Treatment

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Plasma diffusion treatment has been used in industry for more than forty years now. Many of the long-standing processes are still used daily. However, extensive new developments were necessary to keep plasma diffusion treatment competitive. Industrial use of plasma nitriding and plasma carburizing of ferritic steel started in the 70s and 80s. This happened close to new developments in the automotive industry like diesel direct injection systems and gearboxes with a fifth gear. Surface hardness and wear resistance were the important technical features at this time. Nowadays, the requirements of surface treatment processes are much more versatile. As a matter of course the wear protection is still the reason for most of the plasma diffusion treatments, but properties like corrosion protection, electrical conductivity or surface morphology become more and more important. Therefore, over the years, plasma diffusion processes were optimized and tailored to operating conditions. Besides the desired technical properties of treated parts, the development of new steel alloys and the application of austenitic stainless steel require changes in the methods. A brief introduction to the plasma diffusion treatment outlines the way to the current state of the technology. Then the contribution exemplifies typical industrial processes such as plasma nitriding and carburizing as well as new procedures like plasma boriding. A new approach is the plasma boriding of nickel-based alloy, which is used in high temperature applications. Plasma boriding for 2 h at 700°C leads to a surface hardness up to 2500 HV. This results in increased wear resistance for hot forming tools. The latest scientific research shows efforts focused on plasma diffusion treatment of steel, titanium, nickel-based alloy and aluminum.

Keywords

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