Yuliia Chabak et al., J Material Sci Eng 2017, 6:4(Suppl)
DOI: 10.4172/2169-0022-C1-070

Carbides coatings deposited by new pulsed plasma technique

Yuliia Chabak, Vadim Zurnadgy, Tatiana Pastukhova and **Vasily Efremenko**
Priazovskyi State Technical University, Ukraine

Statement of the Problem: Pulsed plasma treatment (PPT) is known for using for surface hardening of ma-chine parts and tools. PPT is usually focused to modify the treated surface due to high speed of heating and cooling followed by the formation of fine crystalline martensite with increased hardness and wear performance. PPT with the use of electro-thermal axial plasma accelerator (ETPA) is quite new technique allowing to deposit the protective coatings with required properties depending on cathode material. Up to now, high-carbon alloyed steels and white cast irons were not used as the cathode material for ETPA plasma processing. The purpose of this study is to study the structure and properties of carbides coating formed using high-Cr cast iron and high-W high speed steel (HSS).

Methodology & Theoretical Orientation: The coatings were manufactured applying ETPA device. As the electrode material, 28%Cr cast iron and 18%W T1HSS were used. The study was performed employing SEM, EDS, XRD, microhardness testing, after PPT post-heat treatment (950°C, 2 h) was used for structure improving.

Findings: Fe-C-Cr(W) and Fe-C-Cr-W coatings of 150-200 um thickness were pulse plasma deposited using ETPA. Changing cathode material allowed to form layered coating structure which is coherent to substrate. Post-deposition heat treatment results in precipitation of Cr- and W-rich carbides phases M_7C_3, M_3C_2, M_6C, M_2C followed by the transformation of austenite into martensite. It was found that PPT using ETPA is accompanied with carbon enrichment of the coating which results in increasing carbides volume fraction to 50-70 %. This causes sharp increase of coating microhardness up to 1200-1500 HV.

Conclusion & Significance: PPT with ETPA combining post-heat treatment can be successfully applied for carbides coating deposition which is perspective approach for wear resistance improvement.

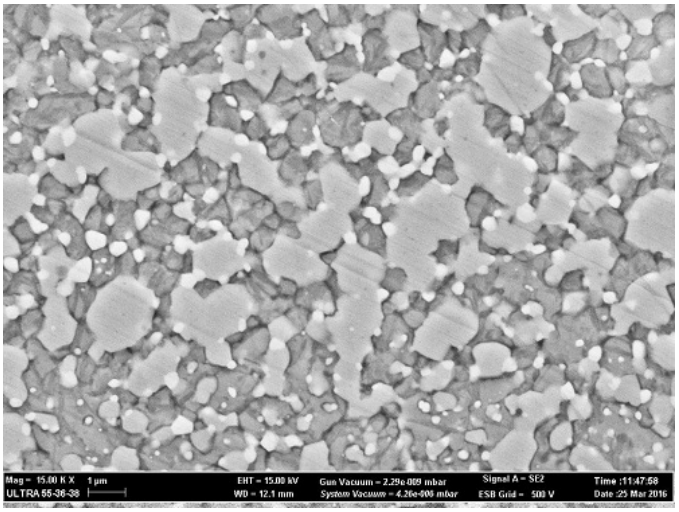

Figure 1: The W-rich carbides in the coating deposited using the cathode of T1 HSS

Biography

Yuliia Chabak has graduated from Priazovskyi State Technical University (PSTU) in 2010 and she has got the PhD degree in Material Science in 2014. Currently, she is working at PSTU in position of Assistant Professor. Her research interests are in the fields of heat treatment and phase-structural transformations in high-alloyed cast irons, as well, she deals with surface modification and protective coating deposition using plasma-assisted techniques.

julia.chabak@yandex.ua