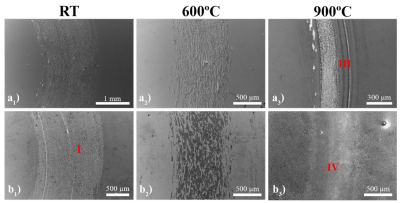
Tribological and machining performance of TiSiN(Ag) coatings deposited by HiPIMS

Diogo Cavaleiro (Centre of Physics of Universities of Minho and Porto, University of Minho, Braga, Portugal);
Carlos Wagner Moura (University of Coimbra, CEMMPRE, Coimbra, Portugal);
Albano Cavaleiro (University of Coimbra, CEMMPRE, Coimbra, Portugal);
Sandra Carvalho (Centre of Physics of Universities of Minho and Porto, University of Minho, Braga, Portugal);
Filipe Fernandes (University of Coimbra, CEMMPRE, Coimbra, Portugal).

NANOTECHNOLOGIES

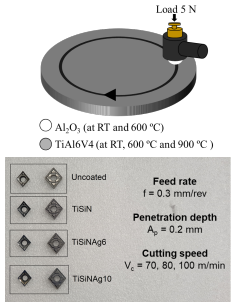


Background

Titanium alloys are some of the most common materials used in a large number structural lightweight components. However, these type of alloys are considered “difficult-to-machine” and so, one of the solutions to improve their machining performance is through the use of solid lubricant materials. Self-lubricant coatings are one of the ways to increase the tools lifetimes which is where the TiSiN(Ag) coating system comes as a possible solution, with silver serving as the solid lubricant agent.

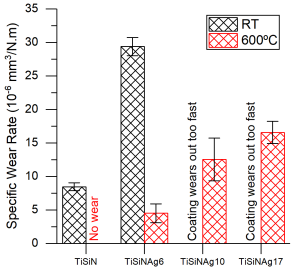
Methodology

TiSiN coatings with increasing Ag contents were deposited onto tungsten carbide discs and inserts for the tribological and machining tests, respectively. The tribogical tests were conducted on a pin-on-disc tribometer and the turning tests, on a mechanical lathe. The lifetime of the coated tools was estimated by measuring the flank wear, considering 0.3 mm wear as the end of life.



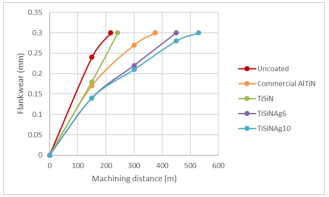
Results

TiAl6V4 tests, revealed that silver shows a promising effect in reducing the friction and increasing the wear resistance of the coatings. An anti-adherent effect was also found. Turning tests showed that increasing the cutting speed lead to an increase in the tool life due to the introduction of silver. An anti-adherent effect was also observed when silver was introduced on the coatings.



Conclusions/Impact

Our tribological studies showed a promising effect of silver in stopping the adhesion of material to the wear surfaces. The machining studies also showed promising results, as the addition of silver allowed not only to increase the cutting speed but also to improve the tool lifetime, even when compared to one of the best commercial coating solutions available in the market.



100 m/min

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