Performance of the CrAlSiN and hydrogen free DLC combined hard coatings deposited on micro tools cutting printed circuit board

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Abstract
Coating systems, including CrAlSiN coatings and various CrAlSiN+DLC combined coatings were deposited using a cathodic arc evaporation system. All the coatings were finished by using technology of modified pulsed current output to the arc evaporators. The DLC coatings were obtained with graphitic target and various mixture of N_2+ Ar gases. All the coating systems with the effects of various conditions on the properties and performance in field of machining printed circuit boards were studied. The properties of the CrAlSiN coating was used as a reference coating. The various CrAlSiN+DLC coatings were evaluated using ball-on-disc wear tests. The wear behavior of the CrAlSiN+DLC combined coatings was affected by the various mixture of N_2+ Ar gases. The hardness of the CrAlSiN+DLC combined coatings increase up to 40GPa as compared to CrAlSiN coating of 35GPa. Furthermore, the cutting performance of micro tools with the various coatings were evaluated by cutting the PCB board. Micro tool with CrAlSiN coatings increased the significant amount of cutting distance as compared to the blank tool. Meanwhile, the tools deposited with CrAlSiN+DLC combined coatings showed the maximum cutting distance of the PCB board which helped to improve tool wear and cutting performance.

Keywords: Pulsed current, cathodic arc evaporation, CrAlSiN, DLC