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Optimization of nanostructured TiAlBN coatings deposited by HiPIMS

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Abstract content

The ever-increasing demands for longer tool life in high-speed machining require multifunctional coatings that display several interlinked characteristics such as high thermal stability, hot hardness and toughness. For this purpose, hard nitride (Ti, Al)N-based nanocomposites coatings have been developed [1–3], but they still suffer from low fracture resistance. In this work, a series of high Al-fraction multilayered TiAlBN nanocomposite coatings deposited by HiPIMS is presented and compared with another TiAlN series (an industrial standard) deposited under the same conditions. The effect of the variation of bias voltage, relative multilayer thickness or the layer composition in the microstructure and the mechanical properties was also studied. TiAlBN coatings exhibit a refined grain structure with individual layer thickness down to 2 nm, which translates into improved fracture toughness over TiAlN while maintaining hardness values up to 40 GPa. The results demonstrate the advantages of TiAlBN multilayered coatings over monolayer TiAlN coatings in terms of thermal stability, hardness and fracture toughness. More recently, the application of positive pulses after the HiPIMS main pulse have shown to enhance the coatings properties [4] and were also applied to TiAlBN materials.

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References

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