

Review in the Development of Ti(CN)-based Cermets

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Abstract

Ti(CN)-based cermets, which are hard materials of ceramic and metal composites, have become one of important tool materials for high-speed, precision cutting applications. Ti(CN) cermets provide improved surface finishing and excellent chip and tolerance control, and offer geometrical accuracy of work-pieces as compared to competing major tool material like WC-Co. However, its low toughness still limits to replace heavy and high-cost WC-Co alloys with the cermets.

Since the performance of tool materials is closely related to the microstructure and subsequently to mechanical properties of the system, it is important to find ways to manipulate the microstructures. In this presentation the issues that we studied past years to design better microstructures for the cermets will be addressed briefly. Some of those will be (1) the stability of $Ti(C_{1-x}N_x)$, (2) the relative stability of various carbides in Ti(CN)-Ni system, in terms of thermodynamic quantities and dissolution behavior, (3) the formation process of the core/rim structure and the role of strain and surface energy on the formation of rim phase and (4) new cermets developed recently.