Deposition of Ternary B-C-N Thin Films
by Ion Plating and Their Tribological Properties

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Ternary boron-carbon nitride films have been deposited by several types of vapor phase techniques, including plasma CVD, ion-beam deposition, laser ablation and sputtering techniques, because of the considerable interest in their promising use as technical materials with many favorable properties for mechanical, optical and electronic applications. The B-C-N ternary system includes the superhard materials of diamond-like carbon (DLC) and cubic boron nitride (c-BN), which exhibit an extraordinary combination of extreme mechanical and physical properties due to their bonding characteristics and crystal structure. Therefore, it is expected that the films of these materials will be very useful for tribological coatings on various industrial substrates. The magnetically enhanced plasma ion plating method has been successfully used to form c-BN films. In this study, ternary B-C-N films were deposited on a Si substrate by reactive evaporation in boron vapor using an electron beam and highly ionized gas supplied adjacent to the substrate. Ar-N_2-CH_4 mixed gas was introduced into the chamber. The tribological properties of films deposited under various conditions were investigated. These properties were compared to evaluate the effect of the gas flow ratio on the resultant compositional changes in this ternary system. Chemical bonding states and the composition and structure of the films were obtained by FT-IR and AES analysis.

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