

Influence of Atomization Gas on Coating Properties under Ti Arc Spraying

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Abstract

An atomization gas used in arc spraying has a great influence on the nitriding process of titanium. Hence, we investigated the chemical composition of titanium coatings reflecting the nitriding process with the use of air, N₂ and Ar as the atomization gas. The ratios of contents (at%) for nitrogen and oxygen in the coatings were 3:1 (air), 6:1 (N₂) and 2:1 (Ar), and the oxygen contents were almost the same. The peak height ratios of TiN_{0.3} to TiN in XRD rose with decrease of the nitrogen content. The TiN peaks of all of the coatings were slightly shifted to higher angles by the oxygen, and their intensity was influenced only by the nitrogen content. In addition, β-Ti and Fe₂Ti were detected in XRD from the surface of thin coatings, and an alloyed layer in the interface region between coating and substrate was observed in SEM. The Ar atomized coating had the thickest alloyed layer. N₂ atomization is efficient in the TiN formation. Ar atomization restrains the reaction of titanium with the nitrogen and oxygen, and promotes the chemical bonding between the coating and substrate.