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**Fluctuation characteristics of thermal residual stresses in
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Abstract: As a component of the total residual stress, thermal residual stress plays an important role in the film/substrate system. To probe into the mechanisms behind the quality fluctuation of coated cemented carbides, the fluctuation characteristics of thermal residual stresses in a PVD $\text{Al}_{0.55}\text{Ti}_{0.45}\text{N}$ coated WC–10Co cemented carbide are investigated by finite element analysis. In turn, SEM image of the substrate was transformed into a real model by Image J, Adobe Illustrator CS6 and SolidWorks. Based on the models involving WC and Co based binder phase (Co phase) in the substrate and the film/substrate interface morphology, thermal residual stress distribution contours and curves in the film were investigated by ABAQUS software. The results show that the fluctuations of the thermal residual stresses in the film can be suppressed by (1) decreasing the grain size and the adjacent degree of WC phase; (2) improving the distribution uniformity of the Co phase and the WC phase; (3) increasing the amount of the solid solution W or W and Cr/V/Ta/Ti/Mo atoms in the Co phase; as well as (4) flattening the

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