

Formulation Method of Ball Indentation Process for Ultra-thin Elastic Body with Mechanics Poisson Effect

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ABSTRACT

Classical ball indentation technique is most notably associated with Heinrich Hertz^[1]. This theory focuses on the elastic bodies with sufficient volume. However, it is very difficult to analyse the contact mechanics when one of the contacting bodies is very thin. The emphasis of this research, therefore, lies in the simplified model with engineering strain and Poisson effect in order to investigate the ball indentation experiment in this case^[2].

This research consisted of three steps. First, FE model of indentation problem for ultra-thin specimen is developed by elastic constitutive relationship for precise analysis. Second, the simplified model is used to evaluate the result of FEM, and its' availability is discussed by comparison with Tani's equation. Third, after comparing the results of FEM, Tani's equation and simplified model, the full contact model and a new equation are proposed.

The results of research indicated that the Tani's equation has good applicability and the full contact model applies when the diameter of indenter is small. And by using the full contact model proposed in this research, it is possible to obtain the Poisson's ratio of the ultra-thin elastic material by indentation test method.

REFERENCES

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