

Overall Elastoplastic Property for Strain Gradient Staggered Biostructure

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ABSTRACT

Biomaterials such as shell, bone, teeth, have a superior combination of stiffness and toughness. They are hierarchical nanocomposites composed of mineral and organic. These microstructure features have been identified as the key factor for the outstanding properties[1]. Therefore, the effect of microstructure must be introduced into the prediction of their properties.

In this paper, for the staggered (brick and mortar) bio-structure, the strain gradient theory, which incorporates the micro-deformation of microstructures, was used to characterize its overall elastoplastic properties. The numerical results showed that the strain gradient effect had a strong influence on the elastoplastic properties. With an actual modulus of organic 100 MPa, the obtained results were in good agreement with experimental results. When the strain gradient effect was small enough to be neglected, the classical results recovered.

REFERENCES

- [1] J. W. C. Dunlop and P. Fratzl, "Biological Composites," *Annu. Rev. Mater. Res.*, vol. 40, no. 1, pp. 1–24, (2010).