

## VISCOELASTIC PROPERTIES OF FIBRE-NETWORK MATERIALS

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### ABSTRACT

Fibre-network materials are widely used as scaffold/substrate for load bearing and other physical and chemical supports in biomedical engineering. One of the most widely used proteins to construct the fibre-network materials is collagen [1]. Collagen composes fibres and fibres intersect mutually to form the network. It has been found that the mechanical properties of tissues are mainly dependent on those of the fibre-network scaffold/substrate. Therefore, three-dimensional beam models of transversely isotropic stochastic fibre-network materials with cross-linkers and different relative densities have been generated for the finite element analysis of mechanical properties [2], where major attention is paid to the viscoelasticity of the collagen fibrous network. Stress relaxation over time under uniaxial tension/shearing has been studied by adopting the Maxwell-Weichert model [3]. The in-plane relaxation modulus has indicated a linear relationship with the relative density while the out-of-plane has illustrated a cubic polynomial relation with relative density. A simplified analytical model with solid elements has been developed aiming to obtain the analytical results of in-plane and out-of-plane relaxation moduli in terms of relative density. The numerical and analytical results have shown good agreement in the tendency.

### REFERENCES

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