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# Finite Element Model of PAAm Hydrogel to Assess Optimum Thickness for Cushioning Applications under Foot

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Hydrogel is considered a potential biomaterial with a cross-linked polymer network swollen with water. Replacement of load-bearing tissues such as cartilage is considered due to this special structure of hydrogels. This paper presents the modelling of polyacrylamide (PAAm) hydrogel as hyper-viscoelastic material by using Abaqus finite element analysis (FEA) software. The compression test data was used to develop the hyperelastic Ogden model, and stress relaxation test data to develop the model's viscoelastic parameters. The developed finite element model was validated with pressure insole test data, and was used to investigate the pressure distribution properties to optimize the thickness suitable for load-bearing and cushioning applications. The results indicated that the thickness of 6 mm to 8 mm polyacrylamide hydrogel was capable of reducing peak pressure below the upper threshold value of 200 kPa.

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