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Swelling beyond Flory

Wednesday, 2 June 2021 15:30 (15 minutes)

Super absorbents are swelling to thousands of percent of strain. Apart from the important industrial applications of these materials, the scientific understanding of electromechanical coupling in these ionized gels are paramount in the scrutiny of mechanotransduction of biological tissue. Regular finite deformation finite element codes fail to simulate these extremely large deformations [6]. A special purpose mixed hybrid finite element code demonstrates its ability to simulate swelling gels down to stiffnesses of 10 kPa, typical for super absorbents [6]. The constitutive modelling of these gels challenges researchers with strong non-linearities [3-5]. The traditional separation of free energy in an elastic, mixing and ionic part is contradicted by experiments [1]. In order to address these issues, new avenues of constitutive modelling are explored [4]. The coupling between electrical and mechanical events may have far-reaching implications in the mechanotransduction phenomena in biological tissues [7]. Indeed, living cells are very well known to respond to electric potential changes and their sensitivity to mechanical load may very well be mediated by electromechanical couplings in the extracellular matrix.

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Time Block Preference

Time Block A (09:00-12:00 CET)

References

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