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MODELLING OF CROSS-LINKING DYNAMICS IN ACTIN NETWORKS

João Pedro Ferreira[(1)], Marco Parente[(2)], Renato Natal Jorge[(1)]

[(1)]**University of Porto, Portugal**
j.ferreira@fe.up.pt, rnatal@fe.up.pt

[(2)]**IDMEC - Faculdade de Engenharia da Universidade do Porto, Portugal**
mparente@fe.up.pt

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Summary: Networks of filamentous proteins such as F-actin play a crucial role in cell mechanics, while the properties of this quite unique biological system still remain underdescribed through physical models. This physically robust network with a spatiotemporal organization, together with crosslinkers and other binding proteins such as myosin, adapt its local microstructure via dynamic self-assembly processes with integration and synchronization upon environmental changes. With a primer into the basic physics of individual filaments and the networks formed by them, a continuum constitutive model for actin networks in the context of current in vitro experiments is discussed in the present work. In the developed model, the dynamics of the actin-binding proteins (ABPs) via diffusion through the interstitial spaces of the network is incorporated. The obtained results show a viscoelastic cross-linked actin network due to the ABPs diffusion. It is observed higher densities of ABPs in the most mechanical solicited zones if the local deformed state is within the binding and contraction thresholds limits of the ABPs.