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Field theory formulation for active network

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Abstract content
   (Max 300 words)
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We develop a model of a polymer network made of both permanent and reversible cross-links (such as myosin II clusters). The formalism of Edwards for a permanent network is used and, was adapted by Fantoni et al to describe clustering. The combination of these two ideas comprises the model of network resembling a natural network. The interesting point here is that the cross-linkages are random and this constraint is ensured by the field theory. As is well known, the randomness causes severe mathematical challenges. Fortunately, many tools have been developed in order to circumvent this. The network is made by mixing many chains of identical lengths, and two different types of cross-linkers with fixed functionality each. The field theory used for polymer network developed by Edwards provides various approaches to dealing with this kind of cross-linkage problem. Edwards used the well known properties of Gaussian integration over the fields defined for each specific type of cross-linker and solved the field-theory using the saddle point approximation method. We expand the field theoretic model and compute the average density of reversible cross-links along the polymeric chain. The behaviour of the network formed has also been investigated including the activity of the linkers (i.e. when the reversible linker can move and when the permanent linker exerts a force). The result of the calculations lead to derivation of the bulk elastic properties for such systems.

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