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Effect of the mechanical deformation on the electrical properties of the polymer/CNT fiber HYUN WOO CHO, BONG JUNE SUNG, Department of Chemistry, Sogang University, Seoul 121-742, Republic of Korea , NANO-BIO COMPUTATIONAL CHEMISTRY LABORATORY TEAM — We elucidate the effect of the mechanical deformation on the electrical properties of the polymer/CNT fiber. The conductive polymer fiber has drawn a great attention for its potential application to a stretchable electronics such as wearable devices and artificial muscles, etc. However, the electrical conductivity of the polymer-based stretchable electronics decreases significantly during the deformation, which may limit the applicability of the polymer/CNT fiber for the stretchable electronics. Moreover, its physical origin for the decrease in electrical conductivity has not been explained clearly. In this work, we employ a coarse-grained model for the polymer/CNT fiber, and we calculate the electric conductivity using global tunneling network (GTN) model. We show that the electric conductivity decreases during the elongation of the polymer/CNT fiber. We also find using critical path approximation (CPA) that the structure of the electrical network of the CNTs changes collectively during the elongation of the fiber, which is strongly responsible for the reduction of the electrical conductivity of the polymer/CNT fiber.

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