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* Correspondence to Dr. Mian Long: mlong@ imech. ac. cn

The Effect of Concentration on Confirmational Transition of Fibroin

Bo HUO[1], Xuan ZHU[2], Yong ZHAI[2]

1. *Institute of Mechanics, Chinese Academy of Science, Beijing* 100080, Email: huobo@ tsinghua. org. cn;
2. *Department of Materials Science and Engineering, Tsinghua University, Beijing* 100084

Introduction The silk fibers of silkworm have extraordinary mechanical properties. People commonly recognize that the ? - sheet structure in it mainly contributes that. So the formation of silk fiber from fibroin gel should be studied. Fibroin is primarily synthesized in the posterior division of silk gland of fifth - instar silkworm larva and from the posterior part to the anterior part of silk gland, the concentration of solution increases as well as a conformational transition, ? - helix to ? - sheet transition, occurs simultaneously. But little is known about the detailed process of the conformational transition under the influence of the concentration of fibroin gel. The present work studies the conformational transition of fibroin solution when it is diluted.

Materials and Methods The posterior division of silk gland was taken out from fifth - instar tussah. The obtained fibroin solution was diluted with distilled water as a series of times, i. e. 8, 16, 32, 64, 128, 192, 256, 320, 384, 640. The concentration of fibroin solutions was measured by BCA protein assay kit . The content of secondary structures of fibroin were measured and calculated by circular dichromatic spectrum instrument.

Results The relation between contents of all conformations and concentrations of fibroin solutions is presented in Fig. 1. It can be shown that the content of ? - sheet retains about 45% when the solutions are diluted from 2.66 wt% to 0.33 wt%. But the content of ? - sheet increases up to 57% at the concentration of 0.15 wt% and 0.11 wt%. Then it dramatically decreases up to 12.9% when the solutions are diluted up to 0.33 wt%. These results agree with the experimental results of Ayub et al. (1994) and Inoue et al. (2000). It is noteworthy that Ayub et al. and Inoue et al. obtained their solutions by dilution. In contrast with the variation of ? - sheet, the content of ? - helix decreases slightly at first and then increases dramatically when the solution is gradually diluted. It can also be found from Fig. 1 that when initially diluting, the contents of ? - turn and random coil in the solution do not change and then increase slightly in the region of dramatical variation of ? - sheet. So it may be predicted that most of ? - sheet structure converted into ? - helix structure at the lower concentration.

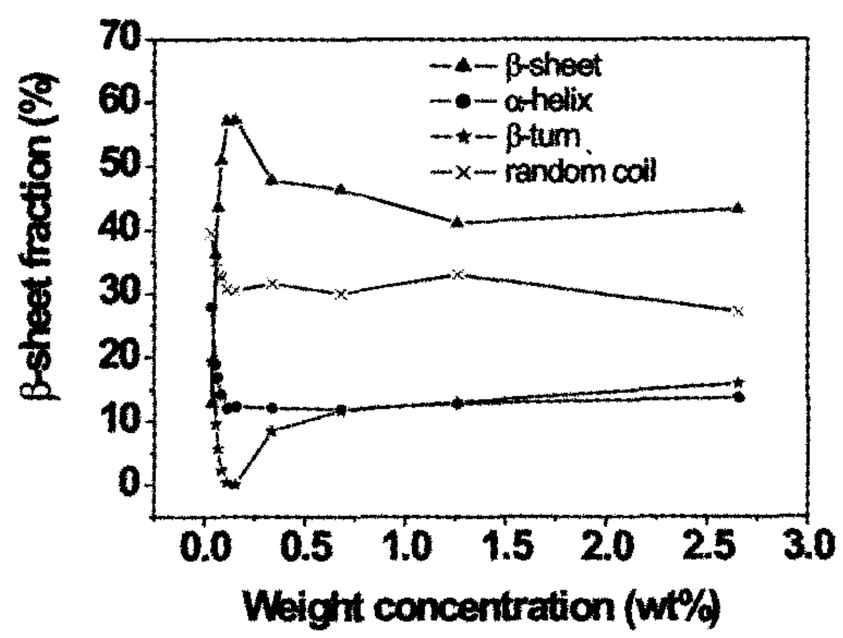

Fig. 1 The relation between the contents of all secondary structures of fibroin solutions and their concentrations.

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