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Control the kinetics and pathway of insulin fibril formation ZHONGLI ZHENG, BENXIN JING, Y. ELAINE ZHU, University of Notre Dame — Protein fibrils have been proposed as possible toxic agents for many amyloid related diseases, such as Alzheimer's disease, however the reaction pathway toward the amyloid fibrillation remain inadequately understood. In this work, we examine the conformational transition of human insulin as the model amyloid protein by single-molecule fluorescence spectroscopy and imaging. By controlling the pH cycling, insulin monomer and oligomers are indentified at given pH variation condition. Furthermore, low frequency ac-electric fields are employed to control the insulin aggregation from its monomers in a microchannel. It is observed that lag time to induce insulin fibrillation can be significantly shortened, in compassion to the commonly used cooling and seeding methods, and exhibits a strong dependence on applied ac-field strength. Additionally, the structure of insulin aggregates under ac-electric fields is observed to be drastically different from that under the temperature control.

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