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Normal mode based description of HET-s prion fibrils conformational change via pH variation

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The HET-s prion fibrils, which is found in the filamentous fungus *Podospora anserina*, exhibit conformational changes according to the pH variation[1]. Due to pH variation inside live body, the HET-s prion fibrils changes its conformation. The conformational change leads the change of fibril arrangement, which shows different mechanical properties.
We built the HET-s prion fibrils in atomic scale based on carbon alpha atoms, and analyze with parameter free elastic network model (pfENM). The pfENM is a variation of ENM without cut-off distance, which considers interactions between all-residues in the structure. Since the distance between fibril is ~22Å, pfENM shows proper vibration behavior with considering long-range interactions between fibrils[2].
Here, we explain the conformational changes as breathing mode with the fundamental eigenmodes of the fibrils such as torsional and bending modes using parameter free elastic network model. The 7^{th}, 10^{th}, and 18^{th} modes showed high correlations with experimentally confirmed directions of conformational change. The 7th eigenmode is the fundamental mode that describes the breathing mode and it describes conformational change of HET-s prion fibril driven by pH oscillations.
The torsional modes derived from pfENM without chemical information, succesfully described the conformational change of HET-s prion fibril induced by pH oscillation. It shows that the direction of confomrational change is involved to structure itself[3]. The chemical stimulation such as pH oscillation is a trigger to the conformational change of HET-s prion fibril. Which indicate that normal mode based study with coarse-grained models may shed light to the mechanochemistry related studies.

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