

Descriptions of additional supplementary Information files

Supplementary Video 1 The conformational change process of OM front view under thermal effect (the group of Ctrl).

Supplementary Video 2 The conformational change process of OM bottom view under thermal effect (the group of Ctrl).

Supplementary Video 3 The conformational change process of OM front view under MV effect (the group of MV).

Supplementary Video 4 The conformational change process of OM bottom view under MV effect (the group of MV).

Supplementary Video 5 The conformational change process of the OM-GNs-1 system under MV effect.

Supplementary Video 6 Dynamic process of GNs-1 during tensile dynamics simulation under MV effect.

Supplementary Video 7 Dynamic process of GNs-1 during tensile dynamics simulation without MV.