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Supplementary Information

Decorin in the spatial control of collagen mineralization

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Characterization for the ultrastructure of COL I fibril， pCOL I fibril, DCN crosslinked COL I fibril and DCN crosslinked pCOL I fibril

Grid of recombinant COL I fibril, pCOL I fibril, 1μM DCN crosslinked COL I fibril and 1μM DCN crosslinked pCOL I fibril were stained by uranyl acetate (Electron Microscopy China, China) and examined by TEM (Hitachi HT7700 EXALEN, Japan) at 100 kV.

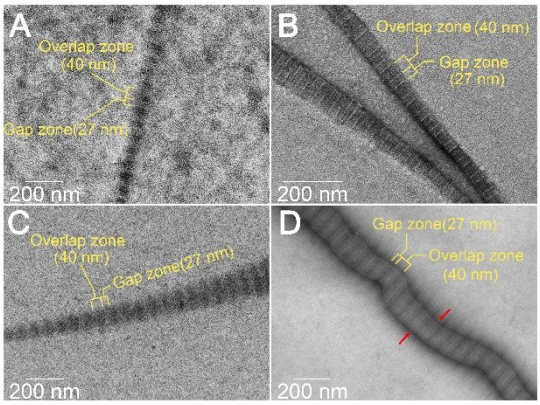

Fig.S1 Representative TEM images of reconstituted COL I, pCOL I fibril, 1μM DCN crosslinked COL I fibril and 1μM DCN crosslinked pCOL I fibril that stained by uranyl acetate. The cross-banding pattern is most clearly identifiable in the pCOL I fibril (B). The pattern is more apparent in the reconstituted COL I fibril (A) compared to the DCN crosslinked COL I fibril (C), probably due to binding with the negative charged DCN narrowing down the charge difference between gap zone and overlap zone. The outline of the DCN crosslinked pCOL I fibril shows an enhanced electron density, contributing to a tube-like appearance of the fibril (D). Moreover, the band in this fibril, which was previously indexed as the gap zone, becomes a dark region, indicating enrichment of electrons, whereas the overlap zone appears as a light band. Red arrows pointed to the contour of pCOL I fibril, which was enhanced by electron.

Characterization for 2 μM DCN crosslinked COL I and pCOL I fibrils after 72 h mineralization treatment

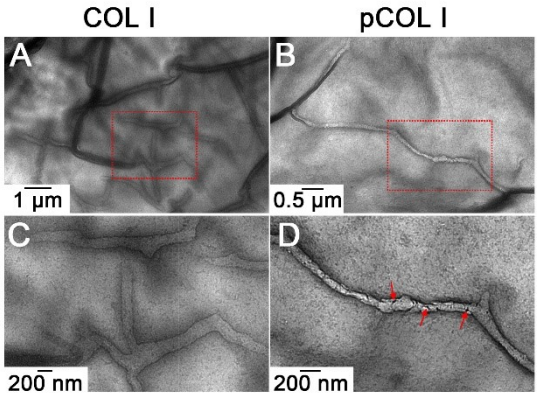

Fig. S2 Representative TEM images of 2 μM DCN crosslinked COL I and pCOL I fibrils after 72 h of mineralization treatment. A shows ultrastructure of 2 μM DCN crosslinked COL I fibrils after 72 h of mineralization, in which unmineralized fibrils are detected as light strips delineated by an electron-dense profile. B shows ultrastructure of 2 μM DCN crosslinked pCOL I fibrils after 72 h of mineralization, in which unmineralized fibrils are detected as light strips delineated by a higher electron-dense profile. (C, D) Corresponding higher magnification of the rectangle region in A and C, respectively. Red arrows pointed to dots with heave electronic density, which may indicate as mineralization cores on the surface of fibrils.

Characterization for 1μM DCN crosslinked COL I and pCOL I fibrils after 24 h mineralization treatment

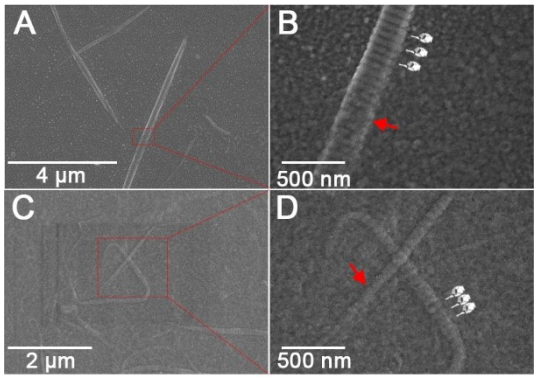

Fig.S3 Representative SEM images of mineralized DCN-conjugated COL I and pCOL I fibrils. (A) 1 μM DCN crosslinked COL I fibrils after 24 h mineralization treatment. (C) 1 μM DCN crosslinked pCOL I fibrils after 24 h mineralization treatment. (B, D) Corresponding higher magnification of the rectangle region in A and C, respectively. Red arrows pointed to the mineralized part of collagen fibrils. Pointers were indexed

to the cross-banding pattern.