Table S1. Reagents and Instruments

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| **Reagents and Instruments** | **Manufacturer** |
| 1H NMR spectroscopy | JEOL, Japan |
| Dynamic Light Scattering (DLS) | Brookhaven Instruments, United States |
| Electrophoretic Light Scattering (ELS) | Brookhaven Instruments, United States |
| Transmission Electron Microscopy (TEM)  | Hitachi, Japan |
| UV-Vis Spectrophotometry  | Shimadzu, Japan |
| FT-IR Spectroscopy  | Thermo Scientific, United States |
| Scanning Electron Microscopy (SEM)  | Hitachi, Japan |
| DMEM/F12 Culture medium  | Gibco, United States |
| Fetal bovine serum (FBS) | Gibco, United States |
| CCK-8 Assay Kit; | Beyotime Biotechnology, China |
| TGF-β3 | Peprotech, United States |
| Alcian Blue Staining Kit | Solarbio, China |
| RNAiso plus | Takara, Japan |
| Hifair® III 1st Strand cDNA Synthesis Kit(gDNA digester plus) | YEASEN, China |
| Hieff UNICON® Universal Blue Qpcr SYBR Green Master Mix | YEASEN, China |
| Primary antibodies: SOX9 (rabbit-derived), Aggrecan (rabbit-derived), Col2a1 (rabbit-derived),Collagen Type II (COL II) (rabbit-derived) | Abcam ,United Kingdom |
| Secondary antibody: HRP-conjugated Goat Anti-Rabbit IgG | Abcam ,United Kingdom |
| Paraformaldehyde | Shanghai Bioengineering, China |
| Multifunctional Microplate Reader | Thermo Fisher, United States  |
| Transwell Chamber | Corning, United States  |
| StepOne Plus Real-Time PCR System | ABI, United States  |
| Electrophoresis Apparatus | Bio-rad, United States |
| Gel Imaging System with Integrated Voltage Stabilizer for DNA Electrophoresis | Tanon, China  |
| Tanon-4200 Gel Imaging System | Tanon, China  |