SUPPLEMENTARY INFORMATION

Materials and methods

Preparation of scaffolds

The polymer protein rS1/9 was purified as previously described [13]. Natural silk from B. mori cocoons was boiled for 1 h in 0.03 M $NaHCO_3$, after which it was thoroughly rinsed with distilled water to remove the glue-like sericin proteins and wax. The polymers were dissolved in a solution of 10% lithium chloride in 90% formic acid. The samples were agitated for 40 min to facilitate dissolution, and then the solutions were centrifuged for 10 min at 11,300 g. The porous scaffolds were prepared from biopolymer solutions (300 mg/ml) using the salt leaching technique. The proper amounts of dry NaCl particles of 200-400 um in diameter were added to the polymer solutions up to 110 mg per 50 mcl and were mixed until they appeared to be homogeneously distributed. Cylindrical container 2 mm in diameter, 5 mm in length was used for scaffold formation. The shaped scaffold samples were dried at room temperature and then treated in 96% ethanol and immersed in distilled water to remove NaCl. The sizes of scaffolds corresponded to the dimensions of the containers. The samples were degassed for 1 h using a vacuum pump and sterilized by soaking in 70% ethanol for 2 h.

Scanning Probe Nanotomography

For SPNT measurements and 3D reconstruction, an NTEGRA-Tomo system (NT-MDT Co., Russia) was used. This system comprises an SPM combined with a Leica EM UC6NT ultramicrotome (Leica Microsystems GmbH, Austria) installed on a MOD-1 active vibration-protective table (Halcyonics GmbH, Germany). The SPM measuring head in the tip-scanning configuration is mounted on the ultramicrotome knife holder. This construction is allowing to

examining the sample surface with the SPM tip immediately after sectioning, when the ultramicrotome arm is in the highest position. The samples of scaffolds were embedded in epoxy resin for ultramicrotome sectioning and AFM measurements. Ultra AFM 35 diamond knife (Diatome AG, Switzerland) was used for sectioning of the samples. For AFM measurements in a semicontact mode cantilever tips NSC14 (Micromasch, Estonia) with a characteristic resonant frequency of about 160 kHz and tip radus smaller than 10 nm were used.

Electron Microscopy

For scanning electron microscopy analysis the scaffold samples were prepared according to standard procedure and sputter-coated with 20-nm-thick gold layer. The specimens were examined using Camscan S2 (Cambridge Instruments, Cambridge, UK) in SEI mode with 10-nm resolution and operating voltage of 20kV. The images were captured using MicroCapture software (SMA, Russian Federation).