Electronic Supplementary Material (ESI) for RSC Advances.

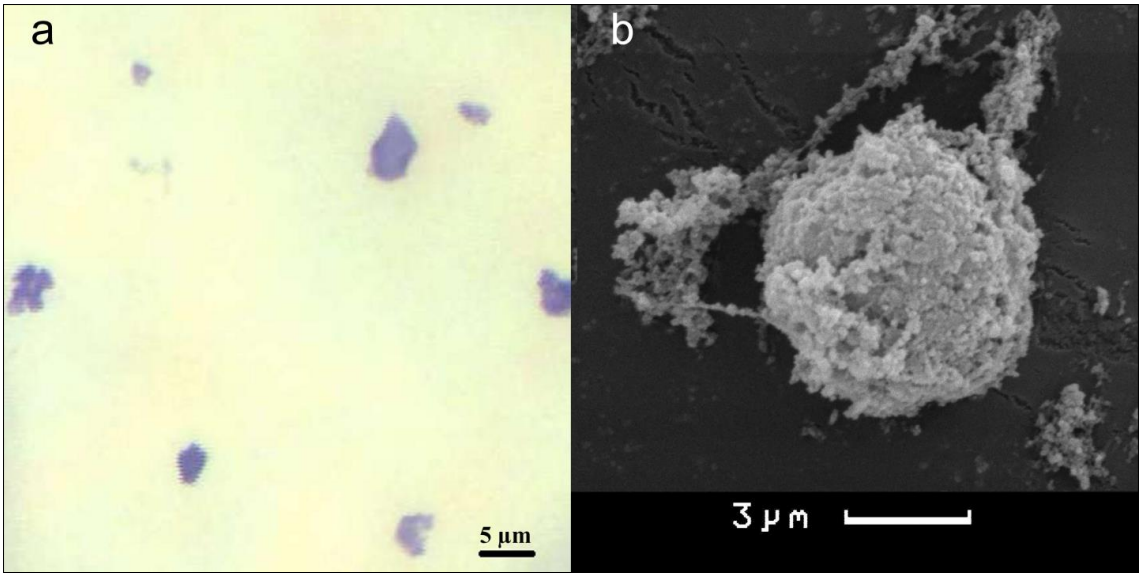

Figure S1. Microparticles of the extracellular matrix of decellularized Wistar rat liver: a) light microscopy, magnification 100×; b) scanning electron microscopy.

Appendix

Statistical analysis of the reconstructed surfaces enables to determine and analyze nanoscale three-dimensional parameters of these surfaces, such as average roughness R_a, the effective surface area σ and length of autocorrelation L_1.

To calculate these parameters reconstructed surface is considered as a two-dimensional array of data (Z elevation values) of size N × M where N and M - the number of columns and rows, correspondingly. Before calculations the surface of the first order (plane) is subtracted from the surface, which corresponds to eliminate of tilting.

The average surface roughness R_a is calculated as an average value of the modulus of deviation of values of height in the pixel array from the average height value:

$$R_a = \frac{1}{N}\frac{1}{M}\sum_{i=1}^{N}\sum_{j=1}^{M}|Z_{i,j} - \langle Z\rangle| \qquad \text{(S1)}$$

where Zi,j – value of the height at the array point (i, j), <Z> - average value of the height Z, averaged over the entire array:

$$\langle Z\rangle = \frac{1}{N}\frac{1}{M}\sum_{i=1}^{N}\sum_{j=1}^{M}Z_{i,j} \qquad \text{(S2)}$$

Effective surface area is calculated as a ratio of surface area to the area of its projection onto the plane. This parameter determines the degree of development of the surface. Reconstructed surface area S can be calculated using a triangulation method, as a sum of array of elementary areas $s_{i,\,j}$ of the surface of elementary cells among four adjacent points of the array (i,j), (i+1, j), (i, j+1), (i+1, j+1). When using a triangulation method for calculating an elementary area, the mid point is also introduced with height $\langle Z_{i,j}\rangle = (Z_{i,j} + Z_{i+1,j} + Z_{i,j+1} + Z_{i+1,j+1})/4$, and effective coordinates (i+1/2, j+1/2) and the elementary area is calculated as the area of four triangles, each is formed by adjacent vertices of elementary cell and a mid point. For example, the area of the triangle formed by the points (i, j), (i + 1, j) and the mid-point is given by:

$$\frac{d_x d_y}{4}\sqrt{1 + \left(\frac{Z_{i,j} - Z_{i,j+1}}{d_x}\right)^2 + \left(\frac{2\langle Z_{i,j}\rangle - Z_{i,j} - Z_{i,j+1}}{d_y}\right)^2} \qquad \text{(S3)}$$

where d_x and d_y - the physical size of the pixels on the respective axes. Since we use surface reconstructed by SPNT, in our case d_x is determined by pixel resolution of SPM measurement and d_y – by slice thickness between successive SPM measurements. Accordingly, the effective surface area is given as

$$\sigma = \frac{1}{N d_x}\frac{1}{M d_y}\sum_{i=1}^{N}\sum_{j=1}^{M}s_{i,j} \qquad \text{(S4)}$$

Length of the autocorrelation L_1 is calculated as coefficient of index of the exponential decay of autocorrelation surface function. In this case, to determine L_1 we use the correlation function "height - height" calculated by the discrete values for each line of the surface as

$$G(nd_x) = \frac{1}{M(N-n)} \sum_{j=1}^{M} \sum_{i=1}^{N-n} \left(Z_{i,j+n} - Z_{i,j}\right)^2 \qquad \text{(S5)}$$

After analysis of the experimental data, we concluded that for the analysis of surfaces of cell macro- and microcarriers reconstructed by SPNT this function is optimally approximated as

$$G(x) = 2\delta^2 \left[1 - e^{-\frac{x}{L_1}}\right] \qquad \text{(S6)}$$

where the δ - mean square deviation, and L_1 - parameter of length of the autocorrelation.

This parameter is interpreted as the characteristic distance over which the dispersion of measured heights of profile of three-dimensional relief is formed. After averaging over the all obtained profiles of surface borders this parameter can be an estimate of the typical lateral dimensions of of the relief features.