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Data Article

Data of continuous harvest of stem cells via partial detachment from thermoresponsive nanobrush surfaces



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ABSTRACT

This data article contains two figures and one table supporting the research article entitled: "Continuous harvest of stem cells via partial

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detachment from thermoresponsive nanobrush surface" [1]. The table shows coating conditions of three copolymers, poly(styrene-co-acrylic acid) grafted with oligovitronectin, poly(styrene-co-N-isopropylacrylamide) and poly(styrene-co-polyethylene glycol methacrylate) to prepare thermoresponsive surface. XPS spectra show the nitrogen peak of the polystyrene surface coated with poly(styrene-co-acrylic acid) grafted with oligovitronectin. The surface coating density analyzed from sorption of poly(styrene-co-acrylic acid) grafted with oligovitronectin by UV-vis spectroscopy is also presented.

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Specifications table

Subject area	Chemistry
More specific subject area	Biomaterials
Type of data	Table, figure
How data was acquired	XPS, UV-vis spectroscopy
Data format	Analyzed
Experimental factors	Poly(styrene-co-acrylic acid) grafted with oligovitronectin was coated on tissue culture polystyrene dishes
Experimental features	See experimental details for each figure
Data source location	Taiwan
Data accessibility	Within this article

Value of the data

- The data show coating conditions of three copolymers, poly(styrene-co-acrylic acid) grafted with oligovitronectin, poly(styrene-co-N-isopropylacrylamide) and poly(styrene-co-polyethylene glycol methacrylate) on polystyrene tissue culture plates for the preparation of thermoresponsive surface.
- The data show which concentration of the coating polymer is necessary to cover the surface.
- The surface coating density can be measured by spectroscopy on the surface coated with poly(styrene-co-acrylic acid) grafted with oligovitronectin
- The data show the evaluation of oligovitronectin measured by XPS spectra of the surface coated with poly(styrene-co-acrylic acid) grafted with oligovitronectin
- The existence of oligovitronectin on the surface coated with poly(styrene-co-acrylic acid) can be verified by XPS measurement.

Data

Table 1 shows coating conditions of three copolymers, (a) poly(styrene-co-acrylic acid) grafted with oligovitronectin (P[St-AA]-oligoVN), (b) poly(styrene-co-N-isopropylacrylamide) (P[St-PNI-

Table 1
Coating conditions of thermoresponsive surface used in this study.

Coating conditions	Coating concentration (mg/ml)			Figure no. used in Ref. [1]
	P[St-AA]	P[St-PNIPAAm]	P[St-PEG]	
25% surface coverage of P[St-AA]-oligoVN	0.750	0	0	Fig. 4 A
25% surface coverage of P[St-AA]-oligoVN with 1:0=P[St-NIPAAm]: P[St-PEG]	0.750	3.000	0	Fig. 2A, 2D, 4A–D
25% surface coverage of P[St-AA]-oligoVN with 9:1=P[St-NIPAAm]: P[St-PEG]	0.750	2.700	0.300	Fig. 4B, 4 C, and 4D
25% surface coverage of P[St-AA]-oligoVN with 4:1=P[St-NIPAAm]: P[St-PEG]	0.750	2.400	0.600	Figs. 2A, C–E, 3, 4A–D
25% surface coverage of P[St-AA]-oligoVN with 7:3=P[St-NIPAAm]: P[St-PEG]	0.750	2.100	0.900	Fig. 2A and D
25% surface coverage of P[St-AA]-oligoVN with 0:1=P[St-NIPAAm]: P[St-PEG]	0.750	0	3.000	Fig. 2A, 4B–D
50% surface coverage of P[St-AA]-oligoVN with 1:0=P[St-NIPAAm]: P[St-PEG]	1.500	3.000	0	Fig. 4B–D
50% surface coverage of P[St-AA]-oligoVN with 9:1=P[St-NIPAAm]: P[St-PEG]	1.500	2.700	0.300	Fig. 4B–D
50% surface coverage of P[St-AA]-oligoVN with 4:1=P[St-NIPAAm]: P[St-PEG]	1.500	2.400	0.600	Fig. 4B–D
50% surface coverage of P[St-AA]-oligoVN with 0:1=P[St-NIPAAm]: P[St-PEG]	1.500	0	3.000	Fig. 4B–D
75% surface coverage of P[St-AA]-oligoVN with 1:0=P[St-NIPAAm]: P[St-PEG]	2.250	3.000	0	Fig. 4B–D
75% surface coverage of P[St-AA]-oligoVN with 9:1=P[St-NIPAAm]: P[St-PEG]	2.250	2.700	0.300	Fig. 4B–D
75% surface coverage of P[St-AA]-oligoVN with 4:1=P[St-NIPAAm]: P[St-PEG]	2.250	2.400	0.600	Fig. 4B–D
75% surface coverage of P[St-AA]-oligoVN with 0:1=P[St-NIPAAm]: P[St-PEG]	2.250	0	3.000	Fig. 4B–D
100% surface coverage of P[St-AA]-oligoVN with 1:0=P[St-NIPAAm]: P[St-PEG]	3.000	3.000	0	Fig. 4B–D
100% surface coverage of P[St-AA]-oligoVN with 9:1=P[St-NIPAAm]: P[St-PEG]	3.000	2.700	0.300	Fig. 4–D
100% surface coverage of P[St-AA]-oligoVN with 4:1=P[St-NIPAAm]: P[St-PEG]	3.000	2.400	0.600	Fig. 4–D, 5B–D, and 6
100% surface coverage of P[St-AA]-oligoVN with 0:1=P[St-NIPAAm]: P[St-PEG]	3.000	0	3.000	Fig. 4–D

PAAm]) and (c) poly(styrene-co-polyethylene glycol methacrylate) (P[St-PEGMA]) to prepare thermoresponsive surface.

Fig. 1 shows high-resolution X-ray photoelectron spectroscopy (XPS) spectra of the N1s peaks obtained on the surface of 0% (a), 25% (b), 50% (c), 75% (d), and 100% (e) of surface coverage of P[St-AA]-oligoVN where the surface coverage % of P[St-AA]-oligoVN is defined as % adsorption of [St-AA]-oligoVN on the surface from the saturated adsorption amount ($500 \mu\text{g}/\text{cm}^2$ for 100%, $375 \mu\text{g}/\text{cm}^2$ for 75%, $250 \mu\text{g}/\text{cm}^2$ for 50%, and $125 \mu\text{g}/\text{cm}^2$ for 25%). Nitrogen atoms originated from oligoVN on the surface [(b)–(e)], whereas no nitrogen atoms were observed on the non-coated tissue culture polystyrene (TCPS) surface (a)

Fig. 2 shows dependence of surface coating density of P[St-AA]-oligoVN on the concentration of coating solution. Coating density was measured by the decrease of optical density of coating solution of P[St-AA]-oligoVN after immersion of TCPS plates into the coating solution.

1. Experimental design, materials and methods

We designed three types of coating copolymers: (a) a stem cell binding site, (b) a thermoresponsive site, and (c) a hydrophilic site. Hydrophobic polystyrene (PSt) was selected as the anchoring site of these three copolymers on the surface of TCPS. For this purpose, we synthesized

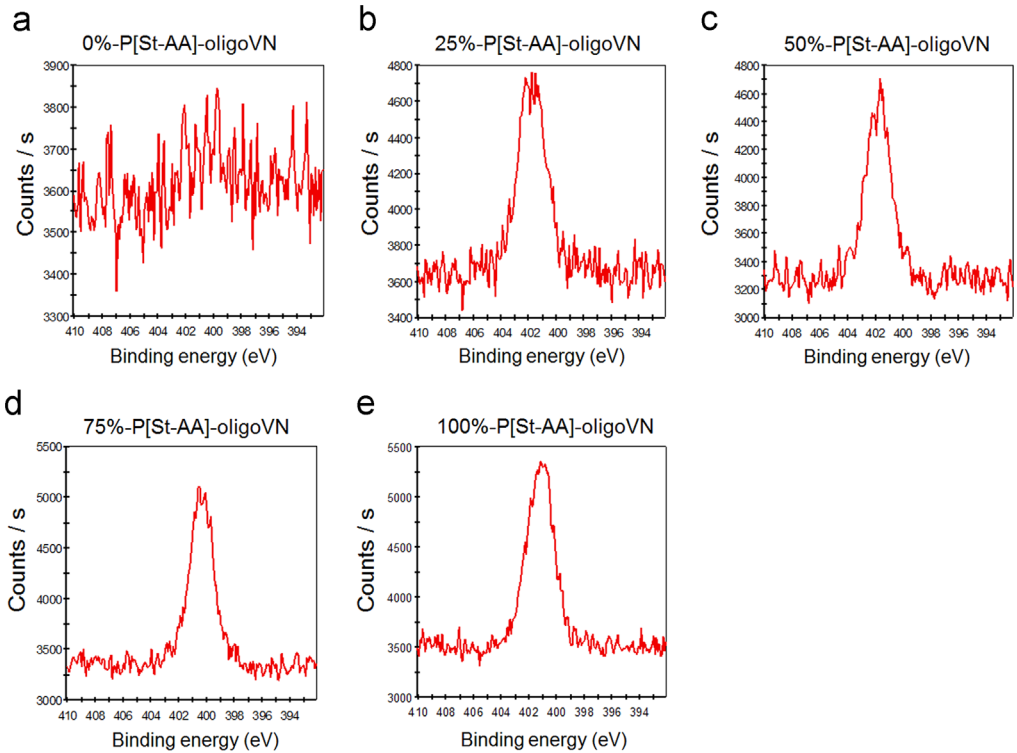


Fig. 1. High-resolution XPS spectra of the N1s peaks obtained on the surface of 0% (a), 25% (b), 50% (c), 75% (d), and 100% (e) of surface coverage of P[St-AA]-oligoVN. Nitrogen atoms originated from oligoVN on the surface [(b)–(e)], whereas no nitrogen atoms were observed on the non-coated TCPS surface (a).

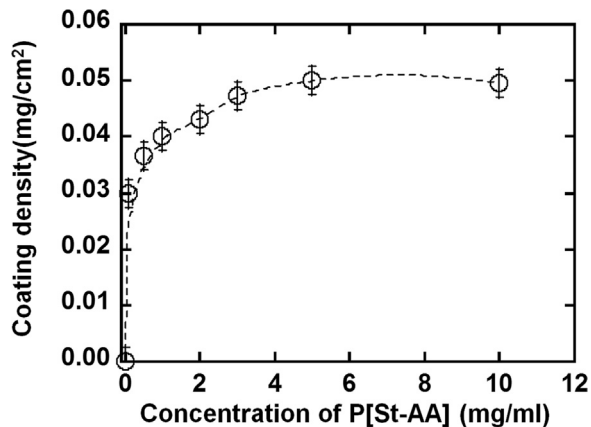


Fig. 2. Dependence of coating density of P[St-AA]-oligoVN on the concentration of coating solution. Coating density was measured by the decrease of optical density of coating solution of P[St-AA]-oligoVN after immersion of TCPS plates into the solution.

three copolymers (a) P[St-AA]-oligoVN having the stem cell binding site of oligoVN (amino acid sequence of KGGPQVTRGDVFTMP) [2], (b) P[St-NIPAAm] having thermoresponsive polyNIPAAm [3] and (c) P[St-PEGMA] having hydrophilic PEGMA to prepare thermoresponsive surface.

1.1. Synthesis of copolymers

P[St-AA], P[St-NIPAAm], and P[St-PEGMA] were prepared by a reversible addition-fragmentation chain transfer (RAFT) polymerization. The synthesis method of these copolymers was described in Ref. [1] in detail.

1.2. Preparation process of thermoresponsive nanobrush surface

0–3 mg/mL of P[St-AA] in ethanol was added in TCPS dishes (4 cm² of surface area, 12 well dishes) for coating of P[St-AA] on the surface for 2 h at 25 °C and subsequently removed from the dishes. TCPS dishes coated with P[St-AA] were activated via immersion in an aqueous solution containing 10 mg/ml N-(3-dimethylaminopropyl)-N'-ethylcarbodiimide hydrochloride (EDC) and 10 mg/ml N-hydroxysuccinimide (NHS) for 1 h at 37 °C after washing the dishes with phosphate buffered saline (PBS, pH 7.2) three times [1,4,5]. Subsequently, the dishes were washed with PBS and immersed in a PBS solution containing 1000 µg/mL of oligoVN for 24 h at 4 °C to prepare P[St-AA]-oligoVN dishes. The dishes were washed with PBS three times [1].

1.3. Characterization of dishes by XPS

The chemical composition of the dishes on the TCPS surface with P[St-AA]-oligoVN was analyzed using X-ray photoelectron spectroscopy (XPS, K-Alpha spectrometer, Thermal Scientific, Inc., Amarillo, TX, USA, equipped with a monochromatic Al-K X-ray source [1486.6 eV photons]). The energy of the emitted electrons was measured using a hemispherical energy analyzer at pass energies ranging from 50 to 150 eV. Data were collected at a photoelectron takeoff angle of 45° with respect to the sample surface. The binding energy (BE) scale was referenced by setting the peak maximum in the C1s spectrum to 284.6 eV. The obtained high-resolution C1s spectra were fitted using Shirley background subtraction and a series of Gaussian peaks [1,5].

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Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.dib.2015.12.056>.

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