Construction of CdS Quantum Dots via Regioselective Dendritic Functionalized Cellulose Template

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EXPERIMENTAL SECTION

\[\{(\text{HO}_2\text{C})_{27}\text{-Den}\}\text{-Cellulose}\] (2). The dissolution (2.5 %) of cellulose in DMAc/LiCl was accomplished by a known procedure. To this solution containing 100 mg of cellulose [microcrystalline cellulose, degree-of-polymerization (DP) = 280], the 3rd-generation isocyanate dendron\(^1,2\) and dibutyltin dilaurate, as catalyst, were added; the ratio of isocyanate to cellulose anhydroglucose unit (AUG) was 3:1 and the catalyst concentration was 2 %, base on cellulose. The mixture was stirred and maintained at 65 °C for 4 days after which, the reaction mixture was added to a MeOH/H\(_2\)O (70:30) solution to yield a precipitate that was next centrifuged, and washed (3×) with a MeOH/H\(_2\)O mixture. The crude product was purified using a dialysis membrane (10,000 MWCO) to remove residual solvent as well as unreacted materials. The solution of modified cellulose 1 was then added to formic acid (10 mL) and stirred for 24 h at 25 °C. After the reaction, the excess formic acid was removed in vacuo.
Biocompatibility Test.\textsuperscript{[3]} CdS/cellulose hybrid 3 coated coverslips were used for the test. Whole blood (9 mL) was drawn from healthy, medication-free human donors into a 10-mL tube containing 1 mL of 3.8 % sodium citrate anticoagulant, centrifuged at 800 rpm for 15 min to collect platelet-rich plasma (PRP). The platelet density was about $3.6 \times 10^5 /\mu$L as determined by Coulter A.C.T diff (Beckman Coulter, Schaumburg, IL). The test coverslips were put in a 24-well culture plate and hydrated by adding 500 µL of \textit{phosphate buffered saline with calcium and magnesium} (PBS) for 15 min, and then incubated with 500 µL of diluted PRP with about $3.0 \times 10^4$ platelets/well for 1 h. The PRP suspension was removed, and the coverslips were gently washed with PBS. Adherent platelets were fixed by adding 500 µL of 1 % \textit{paraformaldehyde} (PFA) in PBS and incubating at 25 °C for 1 h, followed by washing with PBS. The coverslips were then mounted face-up on a coverslide using Crystal Mount. The images were collected with a Spot RT chilled CCD camera and analyzed using Meta Morph software (Universal Imaging Corp.).

RESULTS AND DISCUSSION

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{DSC thermogram of the \{[(HO2C)$_{27}$-Den]-cellulose\} 2 at heating rate of 10 °C/min.}
\end{figure}
In principle, when platelets die, it is difficult to detect their presence on the microscope slide due to shrinkage. In this test, the platelets and platelet aggregates were observed, and CdS/Cellulose hybrids 3 were also appeared near by platelets, as white spots, on Figure SI-2.

![Figure SI-2. Photograph of biocompatibility test for platelet with CdS/Cellulose hybrid 3.](image-url)

REFERENCES