Nanostructured magnetizable materials that switch cells between life and death

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Abstract: Development of biochips containing living cells for biodetection, drug screening and tissue engineering applications is limited by a lack of reconfigurable material interfaces and actuators. Here we describe a new class of nanostructured magnetizable materials created with a femtosecond laser surface etching technique that function as multiplexed magnetic field gradient concentrators. When combined with magnetic microbeads coated with cell adhesion ligands, these materials form microarrays of 'virtual' adhesive islands that can support cell attachment, resist cell traction forces and maintain cell viability. A cell death (apoptosis) response can then be actuated on command by removing the applied magnetic field, thereby causing cell retraction, rounding and detachment. This simple technology may be used to create reconfigurable interfaces that allow users to selectively discard contaminated or exhausted cellular sensor elements, and to replace them with new living cellular components for continued operation in future biomedical microdevices and biodetectors.

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