Optical Encoding of Porous Silicon Particles for Chemical and Biological Screening Applications

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A method for optically encoding micron-sized particles of porous silicon is presented. Optical encoding is achieved obtained by anodisation of crystalline Si in an ethanoic HF solution using a periodic waveform. Modulation of the current density results in a modulation of the porosity of the films. Multilayered photonic structures such as Bragg stacks or rugate filters can be generated this way, with well resolved and narrow optical reflectivity features. More elaborate waveforms produce more complicated two-dimensional photonic crystals, whose reflectivity spectra can be used as optical codes for identification purposes. Ultrasonic fracture or mechanical grinding of the encoded porous silicon films generates Micrometer-sized encoded particles that retain the original optical signature. The use of these particles in biological screening experiments using fluorescently tagged proteins will be presented.