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(71) Applicant *(for all designated States except US)*: SCEPTRE ELECTRONICS LIMITED [—/RU]; Bel Royal House, Hillgrove Street, St Helier, Jersey JE2 4SL (GB).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: SMIRNOV, Valery K. [—/RU]; Furmanova, 70-1, Yaroslavl, 150003 (RU). KIBALOV, Dmitri S. [—/RU]; Krasnoborskaya, 31-66, Yaroslavl, 150051 (RU).

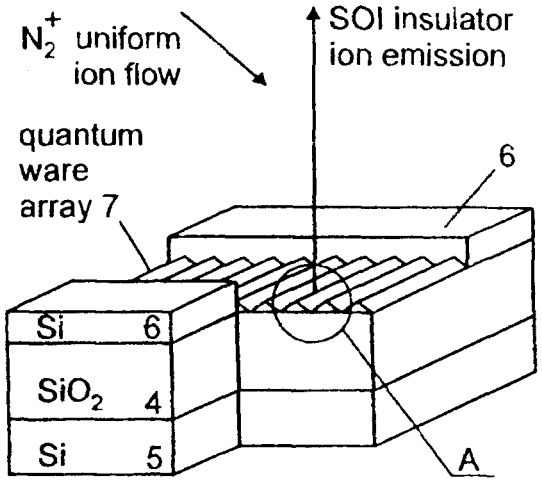
(74) Agent: GORODISSKY & PARTNERS LIMITED; Bolshaya Spasskaya Str., 25 Stroenie 3, Moscow, 129010 (RU).

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(54) Title: METHODS OF FORMATION OF A SILICON NANOSTRUCTURE, A SILICON QUANTUM WIRE ARRAY AND DEVICES BASED THEREON



SOI at sputtering termination

(57) Abstract: A process for controllably forming silicon nanostructures such as a silicon quantum wire array. A silicon surface is sputtered by a uniform flow of nitrogen molecular ions in an ultrahigh vacuum so as to form a periodic wave-like relief in which the throughs of said relief are level with the silicon-insulator border of the SOI material. The ion energy, the ion incidence angle to the surface of said material, the temperature of the silicon layer, the formation depth of the wave-like relief, the height of said wave-like relief and the ion penetration range into silicon are all determined on the basis of a selected wavelength of the wave-like relief in the range of 9 nm to 120 nm. A silicon nitride mask having pendant edges is used to define the area of the silicon surface on which the array is formed. Impurities are removed from the silicon surface within the mask window prior to sputtering. For the purpose of forming a silicon quantum wire array, the thickness of the SOI silicon layer is selected to be greater than the sum of said formation depth, said height and said ion penetration range, the fabrication of the silicon wires being controlled by a threshold value of a secondary ion emission signal from the SOI insulator. The nanostructure may be employed in optoelectronic and nanoelectronic devices such as a FET.

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