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SMOOTHING OF THE ROUGH SURFACE IN NANOTECHNOLOGIES

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The problem of interface roughness and its control has become a fast growing area of intesive experimental and theoretical studies [1-3]. Although roughness is usually undesirable, it represents complicated and very expensive to control in manufacturing.

Isotropic etching represents non-directional removal of material from a substrate via a chemical process using a corrosive liquid or a plasma [4]. Current etchants show significant surface roughening, as well as dependence of etching rates on feature density, size, electrical connectivity, and location on the wafer. Smooth etching of silicon using plasma etch process is highly desirable for some integrated circuit applications and for manufacturing devices such as microstructures, microsensors, and electro-optic devices. Smooth etching is also advantageous to produce surfaces that will be bonded together, since stronger bonds are formed between flat silicon substrate surfaces having minimum roughness. In this paper we present our simulation results based on the level set method for smoothing of the rough surface [5, 6].

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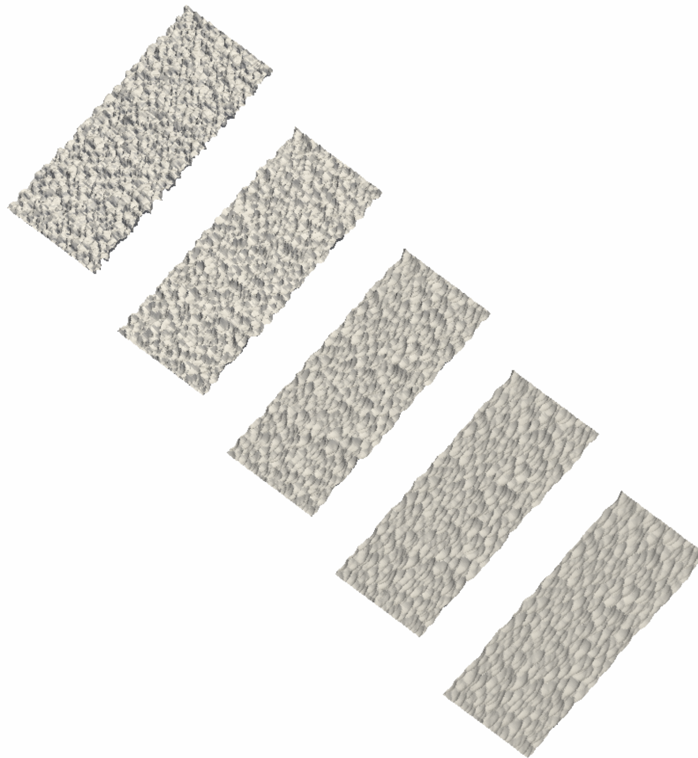

Fig. 1: Smoothing of a rough surface induced by the isotropic etch process.

When the isotropic etching is applied, all surface elements are etched away with the same rate, while in the anisotropic these rates are different. The time evolution of the surface during smoothing by the isotropic etch process is displayed in Fig. 1. As the time of surface exposure to the isotropic etching increases, the roughness decreases and the surfaces become smoother.

Reference

[1] D.K. Goswami i B.N. Dev 2003 *Phys. Rev.* **B68** 033401.
[2] K. Bhattacharjee, S. Bera, D.K. Goswami and B.N. Dev 2005 *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms* **230** 524.
[3] K. Ma and C.B. Yang 2006 *Phys. Rev.* **B20** 697.
[4] M. Museau, C. Masclet and S. Tichkiewitch 2007 I*nternational Journal on Interactive Design and Manufacturing* **1** 127.
[5] B. Radjenoviic, J.K. Lee and M. Radmilovic-Radjenovic 2006 *Computer Physics Communications* **174** 127.
[6] M. Radmilovic-Radjenovic, B. Radjenovic and Z.Lj. Petrovic 2009 *Thin Solid Films* **517** 3954.