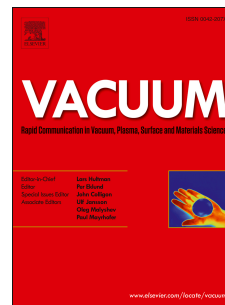


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# Ozone assisted thermal oxidation for fabrication of iron oxide nano-wall arrays with high magnetoresistance

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Abstract

Two dimensional (2D) vertically-aligned crystalline  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> nano-wall arrays were prepared by thermal oxidation of iron substrates under the O<sub>3</sub> ambient. It is found that  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> nano-partitions can be produced in a process temperature region of 450-500°C. Higher growth temperatures (650-700°C) produced wholly nanowires. The transition from 2D sheet-like nanostructures to 1D nanowires can be described by surface diffusion growth mechanism. The iron oxide nanowires present very weak magnetoresistance at different magnetic fields. However, the  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> nano-partitions have very strong magnetoresistive properties which a high of 45% resistance variation obtained at low magnetic field of 300 Gauss. This unique property shows the potential of iron oxide nano-partition arrays in detection magnetic field and solid state memory applications.

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Key words: Two dimensional nanomaterials, Thermal oxidation

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