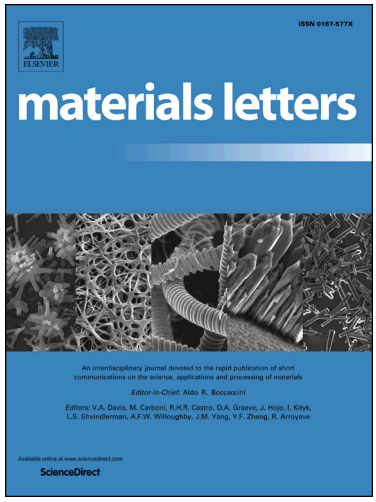

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Direct Catalyst-free Self-Assembly of Large Area of Horizontal Ferromagnetic ZnO Nanowire Arrays

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Abstract: Large-area self-assembled horizontal ferromagnetic ZnO nanowire arrays (NWAs) have been successfully prepared by catalyst-free post-annealing treatment on ZnO thin films. XRD, SEM and TEM analysis show that the ZnO nanowires with a hexagonal wurtzite structure are aligned along the $<11\bar{2}0>$ glide directions and the density of wires is an order of magnitude higher than those fabricated using catalyst. Magnetization measurements indicate that the arrays are ferromagnetic at room temperature. It is found that the annealing plays a key role not only in producing nanowire arrays by thermal treatment but also in inducing magnetism by generating vacancies by evaporation. With a high wire density and ferromagnetic ordering, the horizontal NWAs fabricated by the simple annealing method may be useful for fabricating electrical and spintronic devices at nanoscale.

Key Words: Horizontal Nanowires; Self-Assembly; Magnetic materials; Thin films