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M2 phase in free-standing single-crystalline nanostructures of VO_2 at ambient conditions[1] E. STRELCOV, Southern Illinois University Carbondale, Carbondale, IL, A. TSELEV, I.N. IVANOV, Oak Ridge National Laboratory, Oak Ridge, TN, J. ZHANG, Southern Illinois University Carbondale, Carbondale, IL, J.D. BUDAI, J.Z. TISCHLER, S.V. KALININ, Oak Ridge National Laboratory, Oak Ridge, TN, A. KOLMAKOV, Southern Illinois University Carbondale, Carbondale, IL — A significant drawback of a promising material for realization of an ultrafast switch based on a metal-insulator transition (MIT) - VO_2 - is the inherent linkage between the MIT and lattice transformation from tetragonal to monoclinic with a lattice contribution in the band gap formation in the stable monoclinic M1 structure. On the other hand, the metastable M2 phase exhibits a pure Mott MIT and was shown to be driven metallic without the structural change. Existence of this phase at ambient conditions was reported for Cr and Al-doped VO_2 and nanostructures doped with oxygen vacancies. Here we report stabilization of the M2 phase in VO_2 single-crystalline nanoplatelets (NPls) doped with Al during the growth process via two new methods. Development of these methods came from our recent in situ studies of the NPl growth mechanism. We reconstructed temperature-doping phase diagram for the NPls. Electrical properties of the NPls were also studied as functions of doping level and temperature.

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