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Dielectrophoretic alignment of VO_2 nanowires in device geometries IRVING HERMAN, SARBAJIT BANERJEE, VLADIMIR BLAGOJEVIC, KELLEN PETERSEN, MANAV MALHOTRA, MICHAEL STEIGERWALD, LOUIS BRUS, Materials Research Science and Engineering Center, Columbia University — Bulk VO_2 is characterized by a Mott metal—insulator phase transition at $\sim$68 ^{o}C and has been widely studied for optical and electrical switching applications. However, nanostructured vanadium oxides have been challenging to fabricate and thus not much is known about their properties. Here, we present the AC dielectrophoretic alignment of hydrothermally grown VO_2 nanoribbons, $\sim$40 nm in width and several micrometers in length, in device geometries. The alignment process has been studied as a function of the applied voltage and frequency, gap distance, and concentration of the VO_2 dispersion. VO_2 nanowires have also been precisely positioned in different device geometries, such as across deep trench structures. The electrodes have been designed based on electric-field simulations. The nanowire devices show gate dependence at room temperature. The temperature dependence of the transport properties has also been examined. This work was supported primarily by the MRSEC Program of the National Science Foundation under Award Number DMR-0213574 and the New York State Office of Science, Technology and Academic Research (NYSTAR), and partially by the NSEC Program of the National Science Foundation under Award Number CHE-0641523.

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