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Superconducting properties of aligned flexible networks and yarns of MgB_2-CNT nanowires[1] JULIA BYKOVA, MÁRCIO DIAS LIMA, DERRICK TOLLY, CARTER HAINES, AUSTIN HOWARD, MYRON SALAMON, RAY BAUGHMAN, ANVAR ZAKHIDOV, University of Texas at Dallas
— Magnesium diboride (MgB_2) has attracted great interest due to its outstanding superconducting characteristics. Literature reports showed that addition of carbon nanotubes (CNT) to a MgB_2 matrix significantly improves its properties: CNTs can carry extremely high currents and also provide electrical and mechanical connection between MgB_2 grains. Here we present a new method to produce networks of aligned MgB_2-CNT nanowires which can be spinned into flexible yarns. Free-standing, aligned CNT sheets were used as a starting network. A conformal layer of boron was deposited on CNTs by Laser Assisted Chemical Vapor Deposition. The resultant boron-CNT nanowires (thickness of 70±10 nm) were exposed to magnesium vapor and were converted into MgB_2-CNT composites. The MgB_2-CNT arrays are flexible and can be easily bent and even twisted. Critical temperature reaches 37 K and depends on thickness and crystalline structure of nanowires. Critical current and critical fields were shown to be comparable or even better than standard MgB_2 wires. We discuss the correlation of observed two step behavior in electric transport curves with interconnects between MgB_2-CNT nanowires and Josephson junction network formation.

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