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Study of MgB_2 Films on Niobium Substrate[1] CHENGGANG ZHUANG, DAN YAO, FEN LI, KAICHENG ZHANG, QINGRONG FENG, ZIZHAO GAN, School of Physics and State Key laboratory for Artificial Microstructure and Mesoscopic Physics, Peking University, Beijing 100871, P. R. China — We have successfully fabricated polycrystalline MgB_2 films on metal niobium by using the hybrid physical-chemical vapor deposition technique. T_C (onset) of these samples ranged from 38.5 K to 39.4 K, with ΔT, 0.1 K $\sim$ 0.3 K. The observed T_C was the highest among all the MgB_2 films over metal substrates reported to date. Thicknesses of the films were about 1.0 μm. XRD indicated that lattice constants approached the values of the bulk. The film surface was visible with hexagonal plate-shaped MgB_2 crystallites but not dense enough, shown by SEM observation. A line scanning spectra of EDX on the cutting cross section exhibited that there was an oxygen-rich region at the interface. Also, the diffusion of the Mg atoms deeply into the film has resulted in the tenacity and adherence of the film to the substrate. TEM investigation proved the existence of this buffer layer, $\sim$100 nm. Estimated using magnetic hysteresis loops and Bean model, J_C was above 2.30×10^4 A/cm^2 at 10 K in zero field. The synthesis of MgB_2/Nb films with thickness above one micron, showing certain tenacity, is an important and significant step towards the application of the 2^{nd} generation MgB_2 superconductor wires or tapes.

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