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MgB_2 Ultrathin Films Fabricated by Hybrid Physical Chemical Vapor Deposition and Subsequent Ion Milling. NARENDRA ACHARYA, MATTHAEUS WOLAK, TENG TAN, Temple University, DANIEL CUNNANE, BORIS KARASIK, Jet Propulsion Laboratory, XIAOXING XI, Temple University — Hot electron bolometer (HEB) mixers are a great tool for measuring high-resolution spectroscopy at Terahertz frequencies. MgB_2 offers a higher critical temperature (39 K) compared to commonly used Nb and NbN and boasts a shorter intrinsic electron-phonon relaxation time, giving rise to a broader intermediate frequency (IF) bandwidth. We have fabricated high quality ultrathin MgB_2 films using hybrid physical-chemical vapor deposition (HPCVD) and employing ion milling to achieve thickness down to 2 nm. The thinnest achieved films show high T_c of 28 K with residual resistivity below 28 Ωcm and high critical current Jc of 1x10^6 A/cm^2 at 20 K. As a result of the employed low angle ion milling process, the films remain well connected even after being thinned down since the initial thick films offer a better connectivity than as-grown thin films. The established process offers a way to realize MgB_2 based HEB mixers of extremely low thickness and therefore small local oscillator power requirements and increased IF bandwidth.

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