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High-power terahertz sources operating at room-temperature are promising for many applications such as explosive materials detection, non-invasive medical imaging, and high speed telecommunication. Here we report the results of a simulation study, which shows the significantly improved performance of room-temperature terahertz quantum cascade lasers (THz QCLs) based on a ZnMgO/ZnO material system employing a 2-well design scheme with variable barrier heights and a delta-doped injector well. We found that by varying and optimizing constituent layer widths and doping level of the injector well, high power performance of THz QCLs can be achieved at room temperature: optical gain and radiation frequency is varied from 108 cm^{-1} @ 2.18 THz to 300 cm^{-1} @ 4.96 THz. These results show that among II–VI compounds the ZnMgO/ZnO material system is optimally suited for high-performance room-temperature THz QCLs.