**Highly efficient Gd, Lu co-doped KYW:$Yb^{3+}$ planar and channel waveguide lasers**

D. Geskus, S. Aravazhi, K. Wörhoff, and M. Pollnau
*Integrated Optical MicroSystems Group, MESA+ Institute for Nanotechnology, University of Twente, Enschede, The Netherlands*

Waveguide lasing is achieved in crystalline $Gd^{3+}$, $Lu^{3+}$ co-doped $KY(WO_4)_2$:$Yb^{3+}$ (KYW) thin layers grown on undoped substrates. While the optimum Yb concentration for lasing of 1-3at.% leads to a refractive-index contrast between layer and substrate of only a few times $10^{-4}$, further increase up to $10^{-2}$ can be achieved by co-doping the layer with large amounts of optically inert Gd and Lu ions. The resulting fundamental-mode waveguides have much smaller thickness, thus greatly facilitating microstructuring by ion beam etching. In such KYW:Gd,Lu,Yb layers, in which the Yb ion exhibits spectropcopic properties very similar to those in KYW:Yb, we have demonstrated planar waveguide lasing with 82% slope efficiency and channel waveguide lasing with 61% slope efficiency, with pump thresholds of only 18 mW and 5 mW, respectively.