Nd:YLF/KGW cw Raman Laser operating at the infrared, yellow and lime-green spectral regions

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Raman lasers have the capacity to generate hard to reach wavelengths, such as in the near-infrared region between 1.1 μm and 1.2 μm, and in the yellow-orange range. Due to this ability, we have seen CW Raman lasers undergo rapid development in the past 7 years starting with the first CW external-resonator crystalline Raman Laser in 2004 reported by Grabitchikov et al. In 2005, CW intracavity crystalline Raman lasers were reported by, Demidovich et al and Pask et al. Since then, demonstrations of multi-Watt CW Raman laser using a variety of different Raman crystals such as $Nd:GdVO_4$, $BaWO_4$ and diamond were reported. As the fundamental laser crystal, $Nd:LiYF_4$ (Nd:YLF), can add some benefits to this kind of laser. It presents a weak thermal lens, due to compensation between a negative lens, from the dn/dT changes, and a positive one from the end face bulging. Also, it provides a naturally polarized emission, π and σ emissions, at different wavelengths, 1047 nm and 1053 nm, respectively, shorter than the traditional 1064 nm, thus providing an unusual range of Stokes wavelengths and corresponding visible wavelengths We have investigated a Nd:YLF/KGW Raman laser and demonstrated CW output powers at six different wavelengths, 1147 nm (0.70 W), 1163 nm (0.95 W), 549 nm (0.65 W), 552 nm (1.90 W), 573 nm (0.60 W) and 581 nm (1.10 W), with higher peak powers achieved under quasi-CW operation. It is the first time Raman conversion of the 1053 nm fundamental emission is reported, generating two new wavelengths in crystalline Raman lasers, 549 nm and 552 nm. The weak thermal lensing has made possible to achieve good beam quality, $M^2 \leq 2.0$, and stable operation in relatively long cavities.