New ultrafast laser system based on the Chromium: Forsterite offers wavelength alternative to Ti:sapphire

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Chromium-doped forsterite crystal (Cr:forsterite) is a solid state laser material that fluoresces in the near-infrared region centered around 1250 nm. Cr:forsterite has been successfully used as a gain medium in Kerr lens mode-locked (KLM) femtosecond lasers with cavity designs similar to the popular Ti:sapphire femtosecond laser systems. Cr:forsterite exhibits strong absorption in the near infrared and can be directly pumped with CW lasers operating at 1064 nm, offering a significant reduction in system cost compared to femtosecond lasers pumped in the 532 nm region. We present a design of compact femtosecond Cr:forsterite laser pumped by a 10-W ytterbium fiber laser, generating 60 - 80-fs pulses at 1230-1270 nm with output up to 300 mW. Wavelengths in the 1250 nm range are less damaging to biological samples than other ultrafast lasers making Cr:forsterite based femtosecond laser systems an ideal source of ultrashort pulses for biological and medical applications. This wavelength falls in the transparency window of most biological tissues, allowing deep tissue penetration with minimal photodamaging and making it a valuable alternative source for multiphoton imaging.