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6.45 µm laser for tissue ablation with high-precision

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Tissue ablation in structures of the body, as brain and eye, requires maximum precision in ablation of the target tissue while minimizing collateral damage to adjacent tissue. The viability of the remaining tissue is of great importance in assessing the effectiveness of ablation. Lasers at 6.45 µm wavelength have tremendous potential as high-precision surgical tools, as it offers tissue ablation a minimal collateral damage and a substantial ablation rate. The penetration depth at this wavelength amounts to several µm which is comparable to the cell size, i.e. close to the optimum value, and it is useful for tissue ablation, especially in brain or eye surgery. Then the investigation of 6.45 µm laser has become a hot topic. In this letter we report a LiInS2 (LIS) MIR-OPA system directly pumped by a 1064 nm fundamental laser. The 1064 nm pump source has a maximum energy of 50 mJ, with repetition of 10 Hz and pulse duration of 30 ps. The injection energy of seed laser at 1.27 µm is 52 µJ at repetition of 10 Hz. A type II phase matched LIS crystal (θ=90º, ø=37.5º) is selected for MIR-OPA. The crystal has a size of 3 mm×3 mm×15 mm, with antireflection coated for both faces at the pump, signal and idler wavelengths. When the pump energy was 1.46 mJ, a maximum idler energy of 43.6 µJ at 6.45 µm is achieved with repetition of 10 Hz, corresponding to an optical to optical efficiency of 3%.

Biography

Yu Shen received the Ph.D. degree, in 2014, from Technical Institute of Physics and Chemistry, CAS, Beijing, China. Currently, she is an associate professor with the Technical Institute of Physics and Chemistry, CAS. Her research interests include high power all-solid-state laser, laser materials and nonlinear optical materials.

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