

# Impact of gas cluster ion and accelerated neutral atom beam surface treatments on the laser-induced damage threshold of ceramic Yb:YAG

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**Abstract:** We describe the application of the gas cluster ion beam (GCIB) and of the accelerated neutral atom beam (ANAB) surface treatments to ceramic Yb:YAG. We demonstrate that these techniques allow accurate control of ceramic Yb:YAG surface characteristics and constitute an alternative to conventional surface finishing techniques. In this study, we analyse the impact of angstrom level polishing and surface nano-texturing on laser induced damage threshold (LIDT) in the nanosecond pulsed regime of uncoated and antireflective coated ceramic Yb:YAG samples. We show that both techniques allow meeting the requirements on resilience to laser irradiation at fluence levels characterising high-energy laser systems. Moreover, we show that surface nano-texturing improves the LIDT of coated samples, possibly through an improvement in adherence of coatings to ceramic Yb:YAG substrates.

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