

Solid-state nonlinear highly refractive immersion medium for femtosecond laser micromodification of diamond

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Diamond, as a mineral of substantial interest to the jewelry industry, is the object of close study from the point of view of studying internal defects [1] and as the subject of identification micromarking [2]. Understanding the composition and location of internal volumetric defects is useful when cutting stones, and unique markings increase safety and reduce reputational costs. A subtle point when focusing light in the volume of a rough diamond is the absence of a flat, polished interface, which leads to distortion of the laser beam. Solid-state nonlinear highly refractive immersion allows one to solve this problem by transferring a rough interface surface to a polished plane of the immersion medium.

This work demonstrates the applicability of this approach when considering the deep plastic deformation method, studying its properties and limitations based on the results of transmission in the optical range, multiphoton absorption measurements, x-ray diffraction and photoluminescence analysis.

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[1] Rimskeya E, Kuzmin E *et al* 2023 *Opt. Spectrosc.* **131** 390–394

[2] Danilov P, Kuzmin E *et al* 2022 *Micromachines* **13** 1883