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Photonic nanojet for laser treatment thin metal films

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Laser processing of materials at the submicron level is increasingly attracting attention due to the potential application of optical technologies in a wide range of sensing tasks. These include medicine, biology, microelectronics, and others. Focusing radiation at the scale of the diffraction limit is a rather non-trivial task. In this work, we report on how optical tweezer technologies and photonic nanostructures can be combined to achieve more precise focusing of radiation. Developed algorithms, together with modeling results of optical processes during light transmission through micron-sized objects captured by optical tweezers, as well as thermal effects of laser radiation on metallic coatings, have demonstrated the effectiveness of this technology. Unlike earlier studies, the methodology has been applied to cases involving highly absorbing object, namely gold palladium thin film, yet optimal processing parameters have enabled the localization of the treatment area.

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