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Title. Category. Subcategory. Tags. Title. Category. Subcategory. Tag. Title. Subcategory. Tag. Tab. Title. Subcategory. Tag. Description. This label-free gold nanoparticles based SERS platform for the detection of small biotargets is presented. A facile click-chemistry method was exploited to synthesize the thiolated SERS tags in microemulsions that were highly specific for the target molecules. As a result, a distinct and ultrasensitive Raman signal enhancement was achieved. Our results suggest that this is a powerful, label-free approach to detect DNA that may be applicable to other biological targets for diagnostic and therapeutic applications. This work may serve as an inspiration for the design of improved SERS tags for DNA detection, in vivo Raman imaging, and other biological applications. In this work, we have investigated the use of broadband nonlinear transmission (BNT) to analyze the spectral dynamics of mid-IR (900 nm, 0.9 eV) pump pulses in Yb3+:Lu2O3 (Lu:Yb) crystals. For the BNT experiments, the pump pulses were focused into the sample at 1550 nm and had an approximately Gaussian temporal profile with a duration of 30 fs. Since the initial pump pulse was strongly damped by the Yb3+:Lu2O3 crystal, the spectral behavior of the remaining portion of the pulse had a complex temporal evolution, which is difficult to study with conventional methods. As a new nonlinear signal-processing approach, we have utilized the measurement of a transient nonlinear transmission using a micro-monitored system to obtain a BNT spectrum of the remaining portion of the pulse. The BNT-based spectra show a fast shift of the transmission maximum due to the remaining pump pulse and a slow drift of the transmission maximum with time. These BNT-based measurements are compared with conventional measurements using X-ray pulses with a FWHM of 8 fs at the same laser center wavelength. It is shown that BNT measurements are a useful approach for the characterization of the dynamics of mid-IR pump pulses in Yb3+:Lu2O3 crystals. Using ultrashort laser pulses, we demonstrate the formation of light-induced-damage-vulnerable domain structures in graphene. We show that the regular pattern of fragile regions around intense laser-induced defects is related to the crystallographic orientation of graphene in the direction of the laser pulse polarization and the size of the 82157476af