

Technical Physics Letters 2013 vol.39 N1, pages 1-4

Optical properties of chalcogenide glasses with ion-synthesized copper nanoparticles

Kavetsky T., Valeev V., Nuzhdin V., Tsmots V., Stepanov A.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Substrates of chalcogenide glassy semiconductors As_2S_3 and $\text{Ge}_{15}\text{As}_{21}\text{S}_{63}$ are implanted with Cu^+ ions (energy 40 keV, radiation dose 1.5×10^{17} ion/cm², fixed current density in the ion beam 1 $\mu\text{A}/\text{cm}^2$). The composite layers are analyzed by measuring linear optical transmittance and recording nonlinear optical absorption using the Z-scan technique at 780 nm (probe laser radiation with 150-fs pulses; intensity of 25-100 mW). It is ascertained for the irradiated materials that (1) the linear transmission characteristic of the optical surface plasmon resonance (SPR) band, which indicates the formation of copper nanoparticles in the near-surface region, has emerged and (2) there are simultaneously saturated and two-photon nonlinear absorption types; the latter prevails as the intensity of laser irradiation is increased. © 2013 Pleiades Publishing, Ltd.

<http://dx.doi.org/10.1134/S106378501301015X>
