UNIVERSITY OF ROCHESTER
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LLE Review

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Contents

In Brief

This volume of the LLE review, covering the period of October–December 1994, contains articles on a diagnostic method employing krypton spectroscopy for measurement of temperature and shell-fuel mixing in high-temperature implosions; the first direct assessment of the ion-acoustic decay instability in a large-scale-length, hot plasma; measurements of polarization mode dispersion and group-velocity walkaway in birefringent media using a frequency domain interferometer; an evaluation of the magnetic flux dynamics occurring in an optically triggered, thin-film superconducting switch; the effect of slurry fluid chemistry on particle size distribution during aqueous polishing of optical glass; and the influence of thermal and mechanical processing history in the preparation of well-ordered liquid crystal elastomer systems.

Highlights of the research presented in this issue are

- The addition of ~0.01 atm of krypton gas to the fuel allows the implosion temperature to be conveniently diagnosed through the spectrum of helium-like (Kr^{+34}) and hydrogen-like (Kr^{+35}) lines. The ratio of intensities for the two Kr lines as a function of temperature is sufficient to allow temperature measurements of up to ~10 keV with a maximum error of $<\pm 10\%$.

- The electron plasma wave excited by the ion-acoustic decay instability was observed directly using a novel Thomson scattering diagnostic. The electron temperature in the interaction region, as determined from the frequency of the detected wave obtained using this diagnostic, is in reasonably good agreement with the value predicted by computer simulations.

- A new technique based on frequency domain interferometry for the direct measurement of polarization mode dispersion (PMD) in birefringent media was used experimentally to determine the group velocity walkaway (GVW) of short pulses in nonlinear optical crystals. Experimental measurements of walkaway dependence versus propagation angle in KDP-II crystals using this technique fit the theoretical prediction based on the material dispersion to within an accuracy of $\pm 10\%$.

- A theoretical model of the flux dynamics in an optically irradiated YCBO thin-film superconducting switch has been developed and experimentally verified. Both the magnitude of the peak switched voltage in the secondary coil and its response time show a marked dependence on the intensity of the laser pulse used to initiate switching.

- The slurry charge control effect, a relationship between the polishing slurry pH and the isoelectric point (IEP) of the polishing agent, was identified and established as a key process parameter for the rapid production of high-quality optical surfaces from silica-based glass types. Combinations of slurry fluids and polishing agents in which the fluid pH value was larger than the polishing agent IEP consistently produced surfaces with the lowest surface roughness through inhibition of suspended particle agglomeration and enhanced dissolution of in-process glass constituents.

- The ability to readily induce uniform bulk molecular alignment in liquid crystalline polysiloxane elastomeric films by application of mechanical forces during the final crosslinking stage has been demonstrated. X-ray diffraction data indicate that an externally imposed stress or strain is critical in achieving a monodomain nematic character, and that alignment uniformity is retained after repeated thermal cycling from the nematic-isotropic phase transition ($T_{n\text{-}i}$) to room temperature.

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