

Design and Performance of a ZnSe Tetra-Prism for Homogeneous Substrate Heating using a CO₂ Laser for Pulsed Laser Deposition Experiments

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We report on the design and performance of a ZnSe tetra-prism for homogeneous substrate heating using a continuous wave CO₂ laser beam in pulsed laser deposition experiments. We discuss here three potential designs for homogenising prisms and use ray-tracing modelling to compare their operation to an alternative square-tapered beam-pipe design. A square-pyramidal tetra-prism design was found to be optimal and was subjected to modelling and experimental testing to determine the influence of interference and diffraction effects on the homogeneity of the resultant intensity profile produced at the substrate surface. A heat diffusion model has been used to compare the temperature distributions produced when using various different source intensity profiles. The modelling work has revealed the importance of substrate thickness as a thermal diffuser in producing a resultant homogeneous substrate temperature distribution.

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