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标题: Silver and silver/polystyrene coated hollow glass waveguides for the transmission of visible and infrared radiation

作者: Bledt, CM (Bledt, Carlos M.); Harrington, JA (Harrington, James A.)

编者: Gannot I

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摘要: This study involves the optimization of thin silver coated Hollow Glass Waveguides (HGWs) for low-loss delivery of laser radiation at visible wavelengths and discusses preliminary work in the development of polystyrene dielectric thin films in silver coated HGWs for low-loss radiation delivery at near and far infrared wavelengths. The optimization of the silver thin film deposition procedure in HGWs for reduced transmission losses at $\lambda = 500 - 1050$ nm is presented along with experimental results. Such low-loss hollow waveguides are capable of delivering high power/high energy laser light with no functional damage. The benefits and use of novel polystyrene thin films in HGWs is likewise presented and preliminary experimental results are discussed along with potential applications of said polystyrene coated waveguides. Polystyrene is an attractive material for use as a dielectric thin film in HGWs due to its relatively low refractive index nearing the optimal refractive index of $n = 1.414$ for use as a single dielectric thin film in HGWs. Furthermore, its non-toxicity, low cost, and chemical inertness add to its beneficial use as a transparent thin film at visible and infrared wavelengths ranging from $\lambda = 500 - 3,000$ nm and $\lambda > 50$ μ m. Its broadband transparency additionally allows for its simultaneous use as a dielectric film in HGWs at infrared and visible wavelengths. Preliminary results in the development of polystyrene coated HGWs optimized for transmission at short and long wavelengths are presented, primarily through FTIR spectroscopic methods. The design for the optimization of deposited polystyrene thin films in HGWs based on desired transmission wavelength range is discussed.

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地址: [Bledt, Carlos M.; Harrington, James A.] Rutgers State Univ, Dept Mat Sci & Engr, Piscataway, NJ 08855 USA

通讯作者地址: Bledt, CM (通讯作者), Rutgers State Univ, Dept Mat Sci & Engr, Piscataway, NJ 08855 USA

电子邮件地址: cmbledt@eden.rutgers.edu

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