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Coherent Improves Excimer Laser

Coherent Inc. has introduced an excimer laser series that it claims offers twice the pulse frequency of its previous offering and thus twice the deposition rate. The Lambda SX 540 C provides stabilized energy operation at up to 900mJ and repetition rates up to 600Hz for a wavelength of 308nm. It is designed for use in pulsed laser deposition (PLD) of thin films, including those in HTS coated conductors.

Ralph Delmdahl, Product Marketing Manager at Coherent, said that the doubled repetition rate allows correspondingly higher deposition rates, and eventually faster tape feed rates. But he added: "Depending on the individual PLD system layout, either repetition rate or pulse energy might be the main throughput driver. Accordingly, the best match between excimer laser model and PLD system layout has to be made."

Delmdahl said that increasing throughput was critical to the success of coated conductors: "For coated conductors to emerge and to gain market share over LTS and conventional copper based solutions, much larger production capacities still representing a bottleneck have to be achieved."

Multiple Factors Drive Deposition Quality

Among strategies for thin film deposition, PLD reportedly has the advantage that it reproduces the ablation target's cation stoichiometry. But Delmdahl said: "Establishing the PLD method on the coated conductor reel-to-reel production floor demands upscaling both the lateral (area) and the vertical (thickness) deposition rate along many hundreds of meters."

To some extent, the laser technique's success depends on a facility's layout, commented Delmdahl: "In most industrial installations, the system uses proprietary designs for beam delivery, scanning, and substrate-target geometry. Novel beam delivery algorithms have to be employed which fully leverage the increased repetition rate potential.

"If manufacturers can avoid local overlapping effects during target ablation and maintain laterally homogeneous, large-area superconducting and buffer layer growth, they can capitalize on the high laser pulse frequency without sacrificing coated conductor quality."

The 540 C is a follow-up to the 300 C, which at a wavelength of 308nm has a maximum stabilizing energy of 1000mJ, a maximum stabilizing power of 300W, and a maximum repetition rate of 300Hz. At the same wavelength, the 540 C has an energy of 900mJ, a stabilizing power of 540W, and a repetition rate of 600Hz.

Wavelengths of 308nm and 248nm are most frequently used for high UV energy industrial applications, since they are considered to provide the best combination of precise laser-material-interaction and laser optics lifetime. ❍

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