Selective ultrashort pulse processing of multi-material electrodes

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Multi-layer materials, including metals, metal oxides, and polymers, are now used in various industrial applications, such as optics, gas/vapor sensors, and automotive sectors. These modern complex multi-material systems are characterized by specific features and designs in the micrometer and submicrometer range. The production of these products requires multiple manufacturing steps, including cutting, structuring, welding, and marking [1]. Laser manufacturing has the potential to be applied to these thin multi-material systems. For multi-layer structures, ultrashort pulse lasers can be customized to enable selective coupling and subsequent structuring or removal of specific layers [2, 3]. To be acceptable in industrial settings, laser manufacturing must meet quality, safety, and production rate requirements [4]. This study investigates the use of picosecond lasers for cutting multi-layer electrodes. The quality of the cut and the efficiency of the process were assessed. Two lasers were examined: a 355 nm, 10 picosecond Edgewave laser system and a 1060 nm, 150 picosecond IPG laser system. The laser processing parameters were selected to enhance cut quality and maximize production rate. This work provides early results and recommendations for strategies and approaches for cutting microscale thickness dimensions in multi-material anode and cathode battery electrode stacks to support assembly.

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