Cleaving tailored edges and curved surfaces of transparent materials by ultrafast lasers

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During the last years processing of transparent materials by ultrashort laser pulses has gained increasing interest. Spatial and temporal pulse shaping has already proven its potential for a broad bandwidth of industrial applications, using industrial ready ultrafast lasers and application specific adapted optics. As example advanced Bessel-like beam profiles, 3D-beam splitting concepts and top-hat focus distributions paves the way to achieve high-quality and efficient results for cutting, welding and drilling applications. We furthermore demonstrate the benefit of employing focus distributions being tailored in all three spatial dimensions. With these advanced concepts single-pass, full-thickness modifications with m/s-feed rates were demonstrated for plane substrates with complex inner and outer contours and thicknesses of several mm at the same time with low edge roughness, low chipping and high edge stability.

These advanced processing strategies lead to an increased demand for customized glass edges, including chamfer as well as bevel structures. This enables a reduction of potential edge fractures, an increased edge stability as well as the capability of e. g. curved surfaces. The efficacy of our concepts is presented by evaluating surface and edge qualities of different separated glass structures.