reach the back surface due to the high repetition rate of the laser. The connected voids produce internal stresses and damage as well as surface ablation that facilitate dicing by mechanical stress or thermal shock in a direction along the laser scribe line. While this method potentially offers fast scribe speeds of 300 mm/s, there exists a finite kerf width, surface damage, facet roughness, and ablation debris as the internally formed voids reach the surface.

SUMMARY

~~In a first embodiment, there is provided a method of preparing a substrate for cleavage, the method comprising the steps of: irradiating the substrate with one or more pulses of a focused laser beam, wherein the substrate is transparent to the laser beam, and wherein the one or more of pulses have an energy and pulse duration selected to produce a filament within the substrate; translating the substrate relative to the focused laser beam to irradiate the substrate and produce an additional filament at one or more additional locations; wherein the filaments comprise an array defining an internally scribed path for cleaving the substrate. The method preferably includes the step of cleaving the substrate.~~According to an aspect, there is provided a method of preparing a substrate for cleavage, the method comprising the steps of: irradiating the substrate with a burst of pulses of a focused laser beam, wherein the substrate is transparent to the focused laser beam, wherein a time delay between successive pulses in the burst of pulses is less than a time duration over which relaxation of one or more material modification dynamics occurs, and wherein the burst of pulses have an energy and pulse duration selected to

produce a filament within the substrate; translating the substrate relative to the focused laser beam to irradiate the substrate ad produce an additional filament at one or more additional locations; thereby forming an array of discrete filaments defining an internally scribed path for cleaving the substrate.

The substrate is preferably translated relative to the focused laser beam with a rate selected to produce a filament spacing on a micron scale. Properties of the one or more laser pulses are preferably selected to provide a sufficient beam intensity within the substrate to cause self-focusing of the laser beam.

The one or more pulses may be provided two or more times with a prescribed frequency, and the substrate may be translated relative to the focused