

Laser irradiation of transparent conductive oxide coatings

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Abstract:

Many applications of transparent conductive oxides (TCOs) would benefit from the ability to be able to deposit them as thin films at low temperatures. By removing the need for high temperature deposition techniques, the ability to use polymer substrates for flexible electronics is gained. However, low temperature methods for solution-deposited films (e.g. printed TCOs), still require high temperature, post-deposition, treatment to achieve transparency together with high conductivity. Here we demonstrate laser processing as a viable alternative to oven-based treatments. In particular, the rate of heating is explored as it is this that allows the laser-induced temperature rise to exceed the conventional upper working limit of the substrate.

Thermal modelling has been carried out for laser irradiation of TCO films. Validation of these models has been achieved through the use of an IR camera recording live temperature data. Experimental laser irradiation of solution deposited TCO films has been conducted and preliminary data are presented here. The resistivity of TCO films deposited at low temperatures has been reduced with both UV and IR lasers without damaging the underlying substrate. Both photothermal and photochemical effects have been observed to improve the conductivity of the thin film.

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