Generation of crystalline thin films with variable thickness regions using laser irradiation

Technology #m03-054

Crystalline semiconductor thin films are used in a variety of electronic technologies, including thin film transistors (TFTs), image sensors, and liquid crystal displays (LCDs). This technology is a method to form crystalline thin films using laser irradiation that allows for the creation of different regions having different crystalline grain structures and film thicknesses. A pulsed laser beam is provided specific beam conditions (shape, energy density, homogeneity) and mask configurations to allow for high customization in the creation of crystalline thin films. This technology may be useful to optimize the production of thin films since applied semiconductor technologies often require different regions of the film to have different crystalline characteristics and performance specifications.

A method for decreasing film thickness in regions with low performance requirements to reduce production costs and processing time

The quality of a thin film generated using laser irradiation depends in part on the thickness of the created film. Electron mobility, a desired characteristic within the semiconductor field, is increased in thicker films compared to thinner films. However, it is more time consuming and costly for a laser to produce a thicker film. For example in TFTs, specific regions containing integration devices require higher performance and electron mobility than other regions. This technology could be used to optimally construct such a film using different thicknesses instead of creating the entire film at a single thickness.

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Applications:

- Fabrication of thin film transistors for LCD technologies
- Fabrication of crystalline thin films for image sensors
**Advantages:**

- Decreases cost and production time of crystalline thin films with region-dependent performance requirements
- Allows for highly customizable production of crystalline thin films
- Can be used with several irradiation techniques, including sequential laser solidification (SLS), excimer laser annealing (ELA), and uniform grain structure (UGS).

**Patent information:**

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