Highly uniform polycrystalline silicon thin film transistors produced using sequential excimer laser annealing

Polycrystalline silicon thin film transistors are produced by melting and recrystallizing amorphous silicon using excimer laser annealing. However, conventional annealing methods using a single excimer laser beam may produce non-uniformities due to short pulse durations that limit crystal growth. This technology uses a four excimer laser system for sequential laser firing that enables lateral silicon crystal growth, creating uniform thin film transistors with high electron mobility. As a result, this technology provides a robust method to process thin film transistors that are used in a multitude of flat panel display devices, ranging from televisions to mobile devices.

Sequential excimer laser annealing increases pulse duration range with low energy loss for effective production of highly uniform, large panel thin film transistors

This technology improves uniformity and reduces energy consumption of silicon crystal annealing during the production of thin film transistors. Sequential excimer laser annealing creates specific heat profiles, using one laser pulse to induce melting and subsequent pulses to expand the heated region. Thus, the range of laser pulse duration is increased with low energy loss. The larger pulse duration increases crystal uniformity, and thus electron mobility, while the low energy loss improves the energy efficiency of processing larger panels. As a result, this technology improves the efficiency of producing large and highly uniform thin film transistors used in high performance display devices.

Lead Inventor:

James Im, Ph.D.

Applications:

- Thin film transistors for active matrix liquid crystal displays in flat panel consumer electronics, such as televisions, computer monitors, and mobile devices
• Semiconductor and transistor fabrication
• Photolithography

**Advantages:**

• Enables efficient processing of large size thin film transistor panels with high uniformity
• Increases excimer laser pulse duration range with low energy loss
• Reduces energy requirement for excimer laser annealing
• Extends lateral crystal growth during annealing
• Produces thin film transistors with high electron mobility

**Patent Information:**

Patent Pending
Tech Ventures Reference: IR CU14158

**Inventors**

James S. Im