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(54) Title: METHODS FOR PRODUCING UNIFORM LARGE-GRAINED AND GRAIN BOUNDARY LOCATION MANIPULATED POLYCRYSTALLINE THIN FILM SEMICONDUCTORS USING SEQUENTIAL LATERAL SOLIDIFICATION

(57) Abstract: Methods for processing an amorphous silicon (542) thin film sample (170) into a polycrystalline silicon (540) thin film are disclosed. In one preferred arrangement, a method includes the steps of generating a sequence of excimer laser pulses (164), controllably modulating each excimer laser (110) pulse in the sequence to a predetermined fluency, homogenizing each modulated laser pulse in the sequence in a predetermined plane, masking portions of each homogenized fluency controlled laser pulse in the sequence with a two dimensional pattern of slits (220) to generate a sequence of fluency controlled pulses of line patterned beamlets, each slit in the pattern of slits being sufficiently narrow to prevent inducement of significant nucleation in region of a silicon thin film sample irradiated by a beamlet corresponding to the slit, irradiating an amorphous silicon thin film sample with the sequence of fluency controlled slit patterned beamlets to effect melting of portions thereof corresponding to each fluency controlled patterned beamlet pulse in the sequence of pulses of patterned beamlets.