significantly contributes to the homogenization of crystallization characteristics than the stabilization of the peak ratio does, and achieved the present invention.

MEANS FOR SOLVING BY THE INVENTION

[0006]

According to an aspect of the present invention, there is provided a method for manufacturing a polycrystalline silicon thin film, comprising:

polycrystallizing an amorphous silicon thin film formed on a substrate (excluding an amorphous silicon thin film that includes an area where a metal film is formed between the substrate and the amorphous silicon thin film and an area where no metal film is formed therebetween) by irradiating the amorphous silicon thin film with excimer pulsed laser outputted from one excimer laser oscillator, the excimer pulsed laser having a predetermined energy density to polycrystallize the amorphous silicon thin film,

wherein so that when a polycrystallized silicon thin film is irradiated with white light from an oblique direction while changing the angle and visually observed, no irradiation unevenness is observed irrespective of the irradiation angle, the waveform of the pulsed laser is set, in which the pulsed laser has a plurality of peak groups, each pulsed laser having a full width at half maximum of 20 to 50 ns, in one pulse in temporal intensity change, and a first peak group having a maximum height, of the peak groups, and a second peak group which appears subsequently satisfy, at the irradiated surface, a relationship of (second peak group)/(first peak group)≤0.35 not exceeding 0.35 in terms of peak intensity value when the pulsed laser is irradiated on the amorphous silicon thin film.

ANamely, a method for manufacturing a crystalline semiconductor, according to an embodiment of the present invention comprises: crystallizing an amorphous semiconductor by irradiating the amorphous semiconductor with pulsed laser, in which the pulsed laser has a plurality of peak groups in one pulse in temporal intensity change, and a first peak group having a maximum height, of the peak groups, and a second peak group which appears subsequently satisfy a relationship of (second peak group)/(first peak group)≤0.35 in terms of peak intensity value when the pulsed laser is irradiated on the amorphous semiconductor.

[0007]

A laser annealing apparatus, according to an embodiment of the present invention comprises: a laser oscillator which outputs pulsed laser; an optical system which guides the pulsed laser to an amorphous semiconductor; and a moving device which relatively moves the amorphous semiconductor so that the pulsed laser is irradiated to the amorphous semiconductor with scanning, in which the laser oscillator outputs the pulsed laser so that the pulsed laser has a plurality of peaks in one pulse in temporal intensity change, and a first peak group having a maximum height, of the peak groups, and a second peak group which appears subsequently satisfy a relationship of (second peak group)/(first peak group)≤0.35 in terms of peak intensity value.

[0008]

In the present invention, the above-mentioned peak intensity ratio satisfies the above-mentioned relationship, whereby uniform crystallization characteristics can be secured when the amorphous semiconductor irradiated with the pulsed laser is crystallized. If this ratio exceeds 0.35, the characteristics of the crystallized semiconductor tend to vary.