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Rapid thermal processing of conventionally and electromagnetically cast 100 cm/sup 2/ multicrystalline silicon

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100 cm/sup 2/ n/sup +/pp/sup +/- solar cells have been fabricated by rapid thermal processing (RTP) on conventionally cast (CC) and electromagnetically cast (EMC) multicrystalline silicon (mc-Si). All thermal steps were carried out by fast-ramp (>30/spl deg/C/s) RTP using tungsten-halogen lamps. Emitter and BSF were simultaneously formed by RTP co-diffusion of phosphorous and boron/or aluminum (50-60 seconds) and surface passivation by rapid thermal oxidation, RTO (40-50 seconds). The all-RTP process resulted in 14.1% and 13.3% efficient cells on CC and EMC mc-Si respectively. The EMC cells, when subjected to an additional plasma hydrogen treatment, improved to give the same efficiency as the CC mc-Si cells. Systematic lifetime measurements performed on these materials show that the degradation in the EMC mc-Si is mainly due to the activated crystallographic defects, responding favourably to hydrogenation treatments but poorly to RT-gettering treatments. On the other hand, significant gettering effects are observed in CC mc-Si.

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