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Electron Beam Doping: A novel approach for creating selective emitters in crystalline silicon

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Improving solar cell efficiency while simultaneously reducing the production costs are main tasks of research and development in the field of crystalline silicon solar cell production.
The EB irradiation in a suitable chemical atmosphere under low pressure produces a dopant containing layer on top of the silicon wafer. In the same step the dopant atoms diffuses into silicon wafer by selective heating. This process has been used to produce p-n-junctions in silicon wafers irradiated for instance in PBr_3 atmosphere. Using a focused electron beam (EB) for surface and selective doping of silicon wafers with and without melting areas. Advantages of the diffusion process are that its duration is very short and less energy intensive as the conventional process. Additionally, the EB can be used in one process step to dope the wafer's full scale as well as selective. This helps to reduce process time and energy consumption. The EB is an inherently vacuum-based tool. Therefore, it can be connect to existing vacuum deposition modules in a production line. So an extra tool is not needed for processing selective emitters.

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