Optimization of Al Screen-Printed Contacts for Si Solar Cells

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Background/Relevance
- Silver and copper are the most common contact materials used as top contacts for current silicon solar cells.
- Photolithography and e-beam depositions are extensively used to fabricate the solar cell contacts.

Innovation
- Replacing Ag contacts with Al.
- Utilizing less expensive screen printing to apply the contacts.
- Enhance the ohmic resistance of the Al contact by reducing the oxidation.

Approach
- Fabricate solar cells by applying the contacts on P⁺-type silicon wafers (500-550 μm thickness, 10 to 20 Ω cm resistivity) using screen printing.
- Wafers have been fired by using the Belt Furnaces.
- Measure the printed contact thickness using the DEKTAK 3030.
- Measure the printed contact resistance between a metal and Si by (TLM).

Key Results
- Screen print Ag (90% of concentration) - Al (10% of concentration) fingers on the front surface and a full Ag layer on the rear of the cell for several solar cells.
- Then, the wafers are dried at 170°C for 10 minutes.
- The contact resistance of the wafer can be determined using Transmission line method (TLM).

Conclusions
- Screen printing Ag-Al top contacts for the P⁺ doped silicon surfaces in solar cells achieved acceptable ohmic contact.
- Improving the TLM measurements offered better contact.

Future Work
- Using Al with P⁺-type silicon solar cells.
- Study the factors that may affect the result of Al contact.
- Study the effect of additives on the oxidation of Al paste.