

# Formation of structured low-ohmic p-type contacts on Al-implanted 4H-SiC by laser annealing

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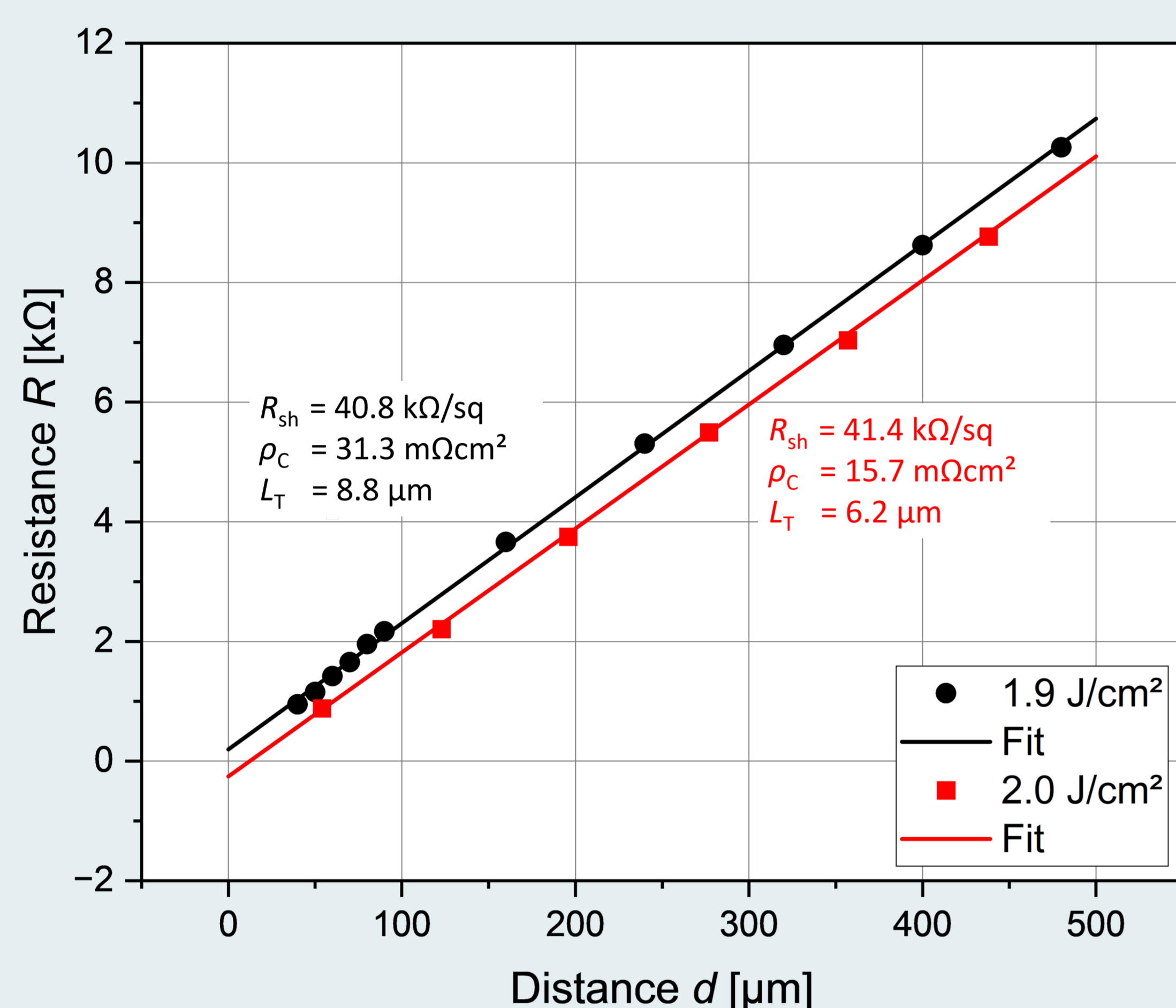
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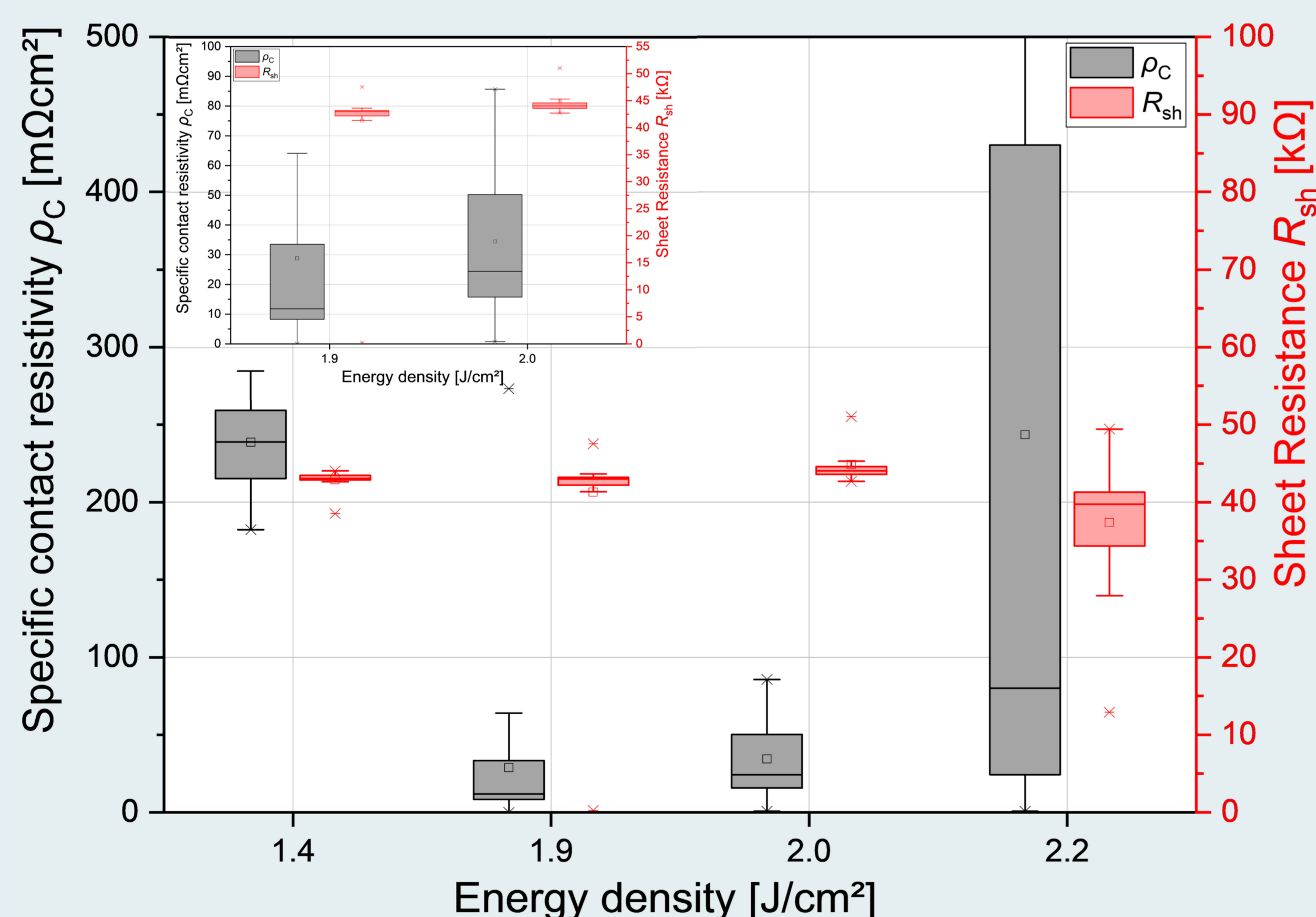
## Motivation and aim of this work

- State of the art: Use of structured Al-Ti contacts as p-type ohmic contacts with subsequent RTA step
- Use of laser treatment for p-type contacts largely unexplored
- Development of a metal layer sequence for p-type contacts for laser treatment
- Development of a method to protect thermosensitive layers from damages by laser treatment
- Manufacturing of structured Ti-Al based ohmic contacts on p-type 4H-SiC using laser annealing**

## Results



*R(d) plot of an exemplary TLM test structure for different energy densities*



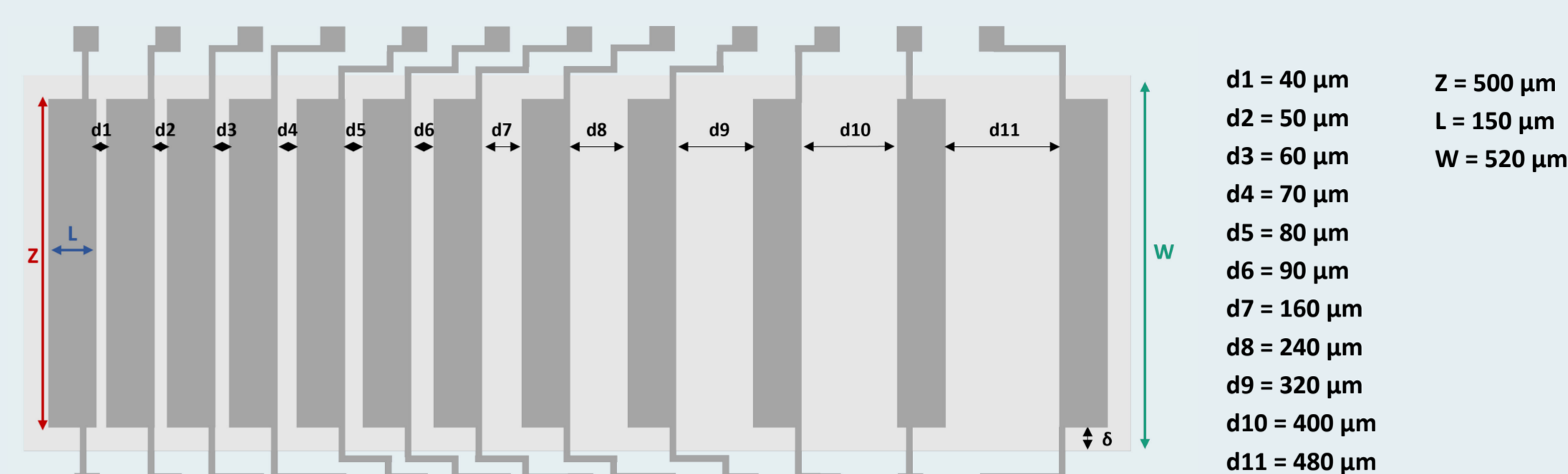
*Determined specific contact resistivity and sheet resistance depending on energy density*

## Discussion

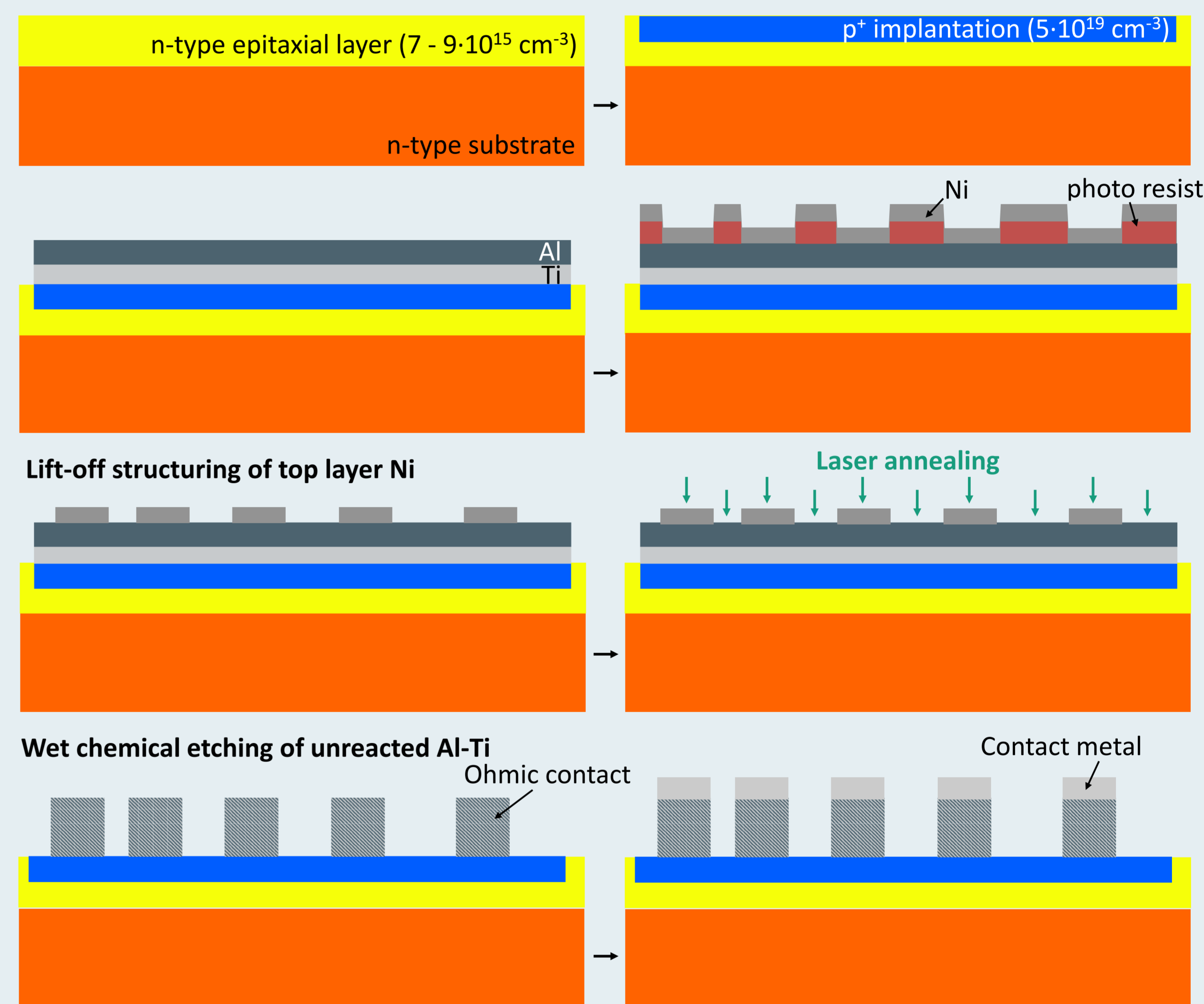
- Sheet resistance independent of energy density
- Minimum contact resistance for 1.9 and 2.0 J/cm<sup>2</sup>
- High standard deviation for 2.2 J/cm<sup>2</sup> caused by misalignment during laser processing

## Processing

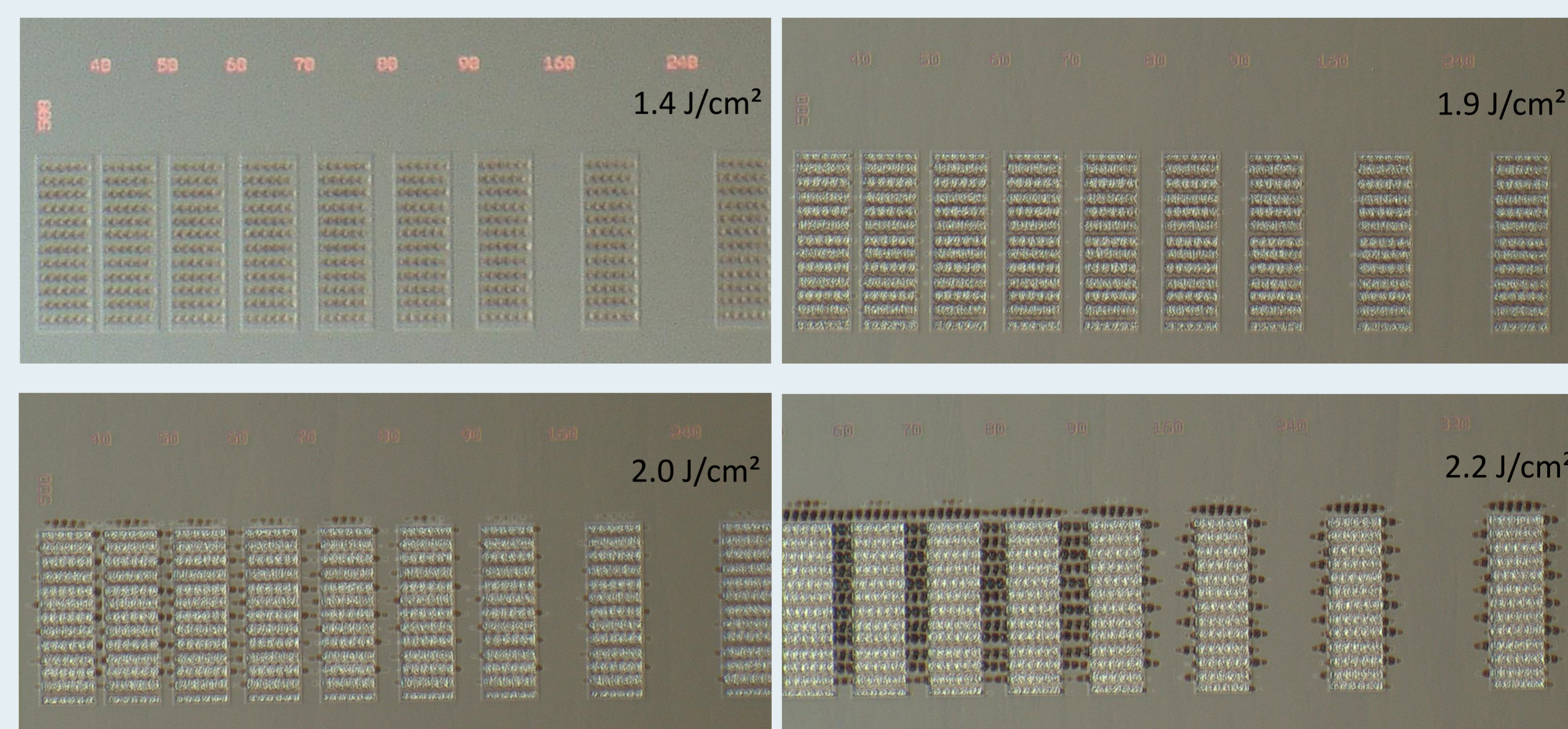
- Fabrication of TLM structures on commercial 150 mm 4H-SiC epitaxial wafers



*TLM test structures in top view*



*Process flow to produce TLM structures*



*Microscope images of lasered TLM structures after wet chemical etching of unreacted Al-Ti*

## Summary

- Manufacturing of p-type ohmic contacts by laser annealing using Ni-Al-Ti metal stacks
- Use of metal stack as a self-aligned mask to protect thermosensitive layers from damages by laser annealing
- Further work necessary like AFM measurement, TEM analysis and XRD measurements to determine the formed compounds