**Realization of a general method for extracting specific contact resistance of silicon-based heterojunctions**

**Liyan Chen 1, Hao Lin 2**\***, Pingqi Gao 2**\***, Wenzhong Shen1**\*

1Institute of Solar Energy, and Key Laboratory of Artificial Structures and Quantum Control (Ministry of Education), School of Physics and Astronomy,

Shanghai Jiao Tong University

\* E-mail: wzshen@sjtu.edu.cn

2School of Materials, Sun Yat-sen University

\*E-mail: linh229@mail.sysu.edu.cn; gaopq3@mail.sysu.edu.cn

**Abstract**

Specific contact resistance (*ρ*C) plays a significant role in determining the efficiency of heterojunction silicon solar cell. Existing methods allow accurate measurement of *ρ*C only in the majority carrier collection region. Here, taking the heterojunctions of transition metal oxide/c-Si(n) as an example, we demonstrated how to extract *ρ*C from the minority carrier (hole) collection region by ingeniously using the expanded Cox and Strack method. On the basis of Technology Computer Aided Design and a double-(diode + resistance) equivalent circuit model, our improved method can separate the electron current density and hole current density from each other and thus the corresponding resistance for both polarities can be well determined. The effectiveness of our improved method in precisely extracting the corresponding *ρ*C was further verified by a series of experimental examples. The present work established a general method of unambiguously extracting specific contact resistance in heterojunction silicon solar cells.

**Keywords:** Silicon solar cells; Dopant-free heterojunction; Contact resistance; Cox and Strack method; Equivalent circuit