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RESEARCH INTERESTS

My research focuses on the advanced packaging fabrication, assembly process development and package level thermal management. Moreover, I also worked on the thermomechanical modeling of the electronic packages and characterization. Author of 26 publications, with 21 as first author with focus as below:

1) Design, fabrication, assembly process development and characterization of the advanced packaging techniques, including 2.5D interposer and 3D integrations.
2) Thermomechanical modeling of the advanced packages to minimize the thermal induced mechanical stress and thermal deformation.
3) Advanced chip/package level cooling solutions (jet cooling and microchannel cooling), including microfluidic device fabrication, CFD modeling and thermal/fluid experimental characterization.

EDUCATION

2015-2020 **Ph.D.** in **ME**, IMEC & KU Leuven, Leuven, Belgium
Advisor: Prof. Martine Baelmans (KU Leuven), Dr. Herman Oprins (IMEC)
Thesis: "High Efficiency Polymer Based Direct Multi-jets Impingement Cooling Solution for High Power Devices"
(*Close cooperation bi-weekly meeting with IMEC's 3D integration program core partners, including Qualcomm, GLOBALFOUNDRIES, Huawei, TSMC, Samsung, SONY*)
2020.02-2020.09 Visiting Ph.D. student in ME, Stanford University, CA
Supervisor: Prof. Kenneth E. Goodson; Adjunct Prof. Mehdi Asheghi

2009-2012 **M.S.** in **EE**, Chongqing University of Posts and Telecommunications, China
Thesis: Thermal management for package level high-power light-emitting diode (LED) system
2011-2012 Visiting Master student in EE, Tsinghua University, Prof. Jian Cai)

2005-2009 **B. S.** in **EE**, Henan Institute of Science and Technology, China

RESEARCH EXPERIENCE

2020-Now **Postdoctoral Fellow**, ME, Stanford University, CA
Advisor: Prof. Kenneth E. Goodson; Adjunct Prof. Mehdi Asheghi
Lead Projects: (funded by Google, Ford, POETS, SLAC)

1) Numerical Study of Large Footprint (24X24mm^2) Silicon-Based Embedded Microchannel-3D Manifold Coolers: 2020.01-2020.09
2) Micro-channel Cooling Technique to Minimize Thermal Deformation of the X-ray and High-power Laser Optics with thermomechanical modeling: 2020.10-now
3) Heterogeneous SiC Power Modules with DBC Embedded Microchannel Cooling: 2021.04-now

2014-2015 **Research Assistant (full-time)**, ME, Hong Kong University of Science and Technology
Advisor: Prof. Ricky Lee @ Electronic Packaging lab
Project: LED Wafer Level Packaging and HV LED System-on-a Chip (SoC) Packaging

2012-2014 **Research Assistant (full-time)**, Institute of Microelectronics, Tsinghua University, China
Advisor: Prof. Jian Cai
Projects @ Electronics Packaging research lab:

1) Performance and Reliability Study of TGV Interposer in 3D package Integration: 2013-2014
2) CMOS Compatible 3D package integration of 5-μm TSV Design, Fabrication, Assembly and Characterization: 2012-2013

HONORS AND AWARDS

- 2020 IMEC Ph.D. Excellence award (3 winners out of 200 PhD students)
- 2019 Chinese Government Award for Outstanding Self-financed Students Abroad
- 2019 FWO Fellowship for Long Term Research Stay, FWO, Belgium
- 2019 IEEE Electronics Packaging Society (EPS) / Electronic Components and Technology Conference (ECTC) Student Travel Award (10 recipients)
- 2019 IEEE Itherm Student Travel Grant Award
- 2013 "Outstanding Paper Award" in 2013 IEEE International Conference on Electronic Packaging Technology ICEPT-HDP

JOURNAL PUBLICATIONS

First author '**Bold**', Corresponding author '*'

1. **Wei, T. W.***, All-in-one design integrates microfluidic cooling into electronic chips, **Nature**, News and Views, 585, 188-189 (2020) doi: 10.1038/d41586-020-02503-1. (**Invited**)
2. **Wei, T. W.***, Oprins, H., Cherman, V., Qian, J., De Wolf, I., Beyne, E., & Baelmans, M. (2018). High-Efficiency Polymer-Based Direct Multi-Jet Impingement Cooling Solution for High-Power Devices. IEEE Transactions on Power Electronics, 34(7), 6601-6612.
3. **Wei, T. W.***, Oprins, H., et al., Heat Transfer and Friction Factor Correlations for Direct on-Chip Microscale jet impingement Cooling with Alternating Feeding and Draining Jets, Int. J. Heat Mass Transf, 2021. (accepted)
4. **Wei, T. W.***, Oprins, H., Cherman, V., Van der Plas, G., De Wolf, I., Beyne, E., & Baelmans, M. (2019). Experimental characterization and model validation of liquid jet impingement cooling using a high spatial resolution and programmable thermal test chip. Applied thermal engineering, 152, 308-318.
5. **Wei, T. W.***, Oprins, H., Cherman, V., Yang, S., De Wolf, I., Beyne, E., & Baelmans, M. (2019). Experimental Characterization of a Chip-Level 3-D Printed Microjet Liquid Impingement Cooler for High-Performance Systems. IEEE Transactions on Components, Packaging and Manufacturing Technology, 9(9), 1815-1824.
6. **Wei, T. W.***, Oprins, H., et al., Experimental and Numerical Study of 3D Printed Direct Jet Impingement Cooling for High Power, Large Die Size Applications, in IEEE Transactions on Components, Packaging and Manufacturing Technology, 2020, doi: 10.1109/TCPMT.2020.3045113.
7. **Wei, T. W.***, Oprins, H., Cherman, V., Beyne, E., & Baelmans, M. (2020). Experimental and numerical investigation of direct liquid jet impinging cooling using 3D printed manifolds on lidded and lidless packages for 2.5 D integrated systems. Applied Thermal Engineering, 164, 114535.
8. **Wei, T. W.***, Oprins, H., Cherman, V., Beyne, E., & Baelmans, M. (2019). Low-cost Energy Efficient On-chip Hotspot Targeted Microjet Cooling for High Power Electronics. IEEE Transactions on Components, Packaging and Manufacturing Technology. vol. 10, no. 4, pp. 577-589, April 2020.
9. **Wei, T. W.*,** Oprins, H., Cherman, V., Beyne, E., & Baelmans, T., "Nozzle Scaling Effects for the Thermohydraulic Performance of Microjet Impingement Cooling with Distributed Returns [J]" in Applied Thermal Engineering, Volume 180, 5 November 2020, 115767.
10. **Wei, T. W.***, Oprins, H., Cherman, V., Beyne, E., & Baelmans, M. (2019). Conjugate Heat Transfer and Fluid Flow Modeling for Liquid Microjet Impingement Cooling with Alternating Feeding and Draining Channels. Fluids, 4(3), 145.
11. **Wei, T. W.,** C. Jian*, et al., Optimization and Evaluation of Sputtering Barrier/seed layer In Through Silicon Via for 3-D integration [J], Tsinghua Science and Technology, 2014, 19(2): 150-160.
12. **Oprins, H.***, Wei, T. W., et al., "A cold shower for chips [J]", Chip Scale Review, Volume 22, Number 6, November, 2018: Page.26.

CONFERENCE PROCEEDINGS

1. Hao Chen, **Wei, T. W.,** Asheghi, M., & Goodson, K. E*. et al., "Feasibility Design of Tight Integration of Low Inductance SiC Power Module and Microchannels Cooler" Applied Power Electronics Conference 2021. (submitted)
2. **Wei, T. W.,** Jung, K. W., Piazza, A., Hazra, S., Iyengar, M., Malone, C., Asheghi, M., & Goodson, K. E*. Parametric CFD Study of Large Footprint (24 x 24 mm2) Silicon-based Embedded Microchannel-3D Manifold Coolers. InterPACK 2020. (presentation only)
3. **Wei, T. W.***, Oprins, H., Cherman, V., Yang, Z., Rivera, K., Van der Plas, G., Pawlak, B. J., England, L., Beyne, E., & Baelmans, M., "Demonstration of Package Level 3D-printed Direct Jet Impingement Cooling applied to High power, Large Die Applications", 2020 IEEE 70th Electronic Components and Technology Conference (ECTC), Orlando, FL, USA, 2020, pp. 1422-1429.
4. **Wei, T. W.***, Oprins, H., Cherman, V., De Wolf, I., Van der Plas, G., Beyne, E., & Baelmans, M. (2019, May). Thermal Analysis of Polymer 3D Printed Jet Impingement Coolers for High Performance 2.5 D Si Interposer Packages. In 2019 18th IEEE Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITherm) (pp. 1243-1252). IEEE.
5. **Wei, T. W.***, Oprins, H., Cherman, V., De Wolf, I., Beyne, E., & Baelmans, M. (2019, May). First Demonstration of a Low Cost/Customizable Chip Level 3D Printed Microjet Hotspot-Targeted Cooler for High Power Applications. In 2019 IEEE 69th Electronic Components and Technology Conference (ECTC) (pp. 126-134). IEEE.
6. **Wei, T. W.***, Oprins, H., Cherman, V., Van der Plas, G., De Wolf, I., Beyne, E., & Baelmans, M. (2017, December). High efficiency direct liquid jet impingement cooling of high-power devices using a 3D-shaped polymer cooler. In 2017 IEEE International Electron Devices Meeting (IEDM) (pp. 32-5). IEEE.
7. **Wei, T. W.***, Oprins, H., Cherman, V., De Wolf, I., Beyne, E., Yang, S., & Baelmans, M. (2018, May). 3D Printed Liquid Jet Impingement Cooler: Demonstration, Opportunities and Challenges. In 2018 IEEE 68th Electronic Components and Technology Conference (ECTC) (pp. 2389-2396). IEEE.
8. **Wei, T. W.***, Oprins, H., Cherman, V., De Wolf, I., Beyne, E., & Baelmans, T. (2018). Nozzle array scaling analysis of the thermal performance of liquid jet impingement coolers for high performance electronic applications. In The 16th International Heat Transfer Conference. The Assembly for International Heat Transfer Conferences; Beijing, China.
9. **Wei, T. W.**, Qiu X., Lo J C C, Ricky L.*. Wafer level bumping technology for high voltage LED packaging[C]//2015 10th International Microsystems, Packaging, Assembly and Circuits Technology Conference (IMPACT). IEEE, 2015: 54-57.
10. **Wei, T. W.**, Wang Q., Cai J.*, et al. Performance and reliability study of TGV interposer in 3D integration[C]//2014 IEEE 16th Electronics Packaging Technology Conference (EPTC). IEEE, 2014: pp. 601-605.
11. **Wei, T. W.**, Wang, Q., Liu, Z., Li, Y., Wang, D., Wang, T., & Cai, J*. (2012, December). A 3D integration testing vehicle with TSV interconnects. In 2012 14th International Conference on Electronic Materials and Packaging (EMAP) (pp. 1-5). IEEE.
12. **Wei, T. W.**, Cai J.*, Wang Q., et al. Copper filling process for small diameter, high aspect ratio through silicon via (TSV)[C]//2012 13th International Conference on Electronic Packaging Technology & High Density Packaging. IEEE, 2012: 483-487. (Outstanding Paper Award)

PATENTS

1. Wang Q*, **Wei, T. W.**, "Adapter panel and manufacturing method and encapsulation structure thereof and bonding method for the adapter panel", US15528049.
2. Cai J.*, **Wei, T. W.**, Wang Q., "A Novel Temporary Bonding Method in 3D Integration System using Special Trenches", China, CN 201310263752.2, Filed.
3. Cai J.*, **Wei, T. W.**, Wang Q., "A Novel Fabrication and Assembly Method for Wafer Level Packaging

using Cu Electroplated Interconnection", China, CN 201310263685.4, Filed.
4. Cai J.*, **Wei, T. W.**, Wang Q., "Structure and Fabrication Method of One Reconfigurable Antenna with Through Silicon Via Interposer", China, CN 201310002584.1, Filed.
5. Cai J.*, **Wei, T. W.**, Wang Q., "Structure and Fabrication Method of One Temporary Bonding Module for Thin Chip/Wafer Assembly", China, CN 201410035388.9, Filed.
6. Cai J.*, **Wei, T. W.**, Wang Q., "A Novel Method applied to Thin Chip/Wafer Bonding in 3D integration using Protective Structures", China, CN 201410034813.2, Filed.
7. Wang Q., **Wei, T. W.**, Cai J.*, "Structure and Assembly Method of Interposer Integration using TGV and Solder Ball Inserted Interconnection", China, CN 201410665104.4, Filed.
8. Cai J.*, **Wei, T. W.**, Wang Q., "Structure and Fabrication Method of Through Polymer Filled Via using High Density and Low Stress Interconnection", China, CN 201410666123.9, Filed.
9. Cai J.*, **Wei, T. W.**, Wang Q., "A novel Method for Tapered Via Profile Amendment using Polymer Filled Structure", China, CN 201410664902.5, Filed.

TEACHING & ADVISING EXPERIENCE

High-School Teacher (Part of the university education)
Responsibilities included developing new class materials, leading class discussions, supervising labs, grading all assignments, and meeting with students individually.

- Calculus and Chinese class at Xinxiang Senior High School, >50 students, 2009

Advising Experience

- Mentoring two master students from the Department of Materials (MTM), at KU Leuven, 2019-2020
- Mentoring two master students for topic on "Integrated project on topology optimization" in the Mechanical Engineering Department at KU Leuven and IMEC, 2019
- Mentoring one master student on the "Numerical modeling of embedded microchannel cooling" in the Nanoheat lab at Stanford University, 2020
- Mentoring one undergraduate student at Stanford with topic "embedded channel cooling for laser optics"

ACADEMIC COMMITTEE

- Organization committee 2021 IEEE REPP (Reliability for Electronics and Photonics Packaging)
- Technical program committee of IEEE 3DIC 2021 Conference
- Executive committee member of IEEE-EPS Silicon Valley Area Chapter 2021
- IEEE Electronics Packaging Society EPS Thermal and Mechanical Technical Committee Members
- IEEE Electronics Packaging Society EPS-Reliability Technical committee
- Reviewer and thermal technical working group contributor to the IEEE HIR (Heterogeneous Integration Roadmap). IEEE HIR is intended to guide the electronic/semiconductor product development over the next decade, with projections out through 2034.

SERVICES AND MEMBERSHIPS

Services
1. Journal reviewer of "**Nature**" (2020): related to integrated microfluidics cooling.
2. Journal reviewer with 58 reviews: Applied Sciences, ASME Journal of Electronic Packaging, Energies, Int. J. Heat Mass Transf, JMM, and Journal of Physics D: Applied Physics, IEEE CPMT, and ASME Journal of Fluids Engineering.

Professional Memberships
1. American Society of Mechanical Engineer (ASME) membership
2. IEEE Membership and IEEE Young Professionals
3. IEEE Electronics Packaging Society Membership