

# Nilesh Badwe, Ph.D.

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## EDUCATION

- **Ph.D. in Materials Science and Engineering** (Nov 2014)  
Arizona State University (ASU) *Dissertation: Fracture of Nanoporous Gold* GPA: 4.00/4.00
- **B. Tech. in Metallurgical Engineering and Materials Science** (May 2008)  
Indian Institute of Technology, Bombay (IIT Bombay) GPA: 8.91/10.00

## PROFESSIONAL EXPERIENCE

- **Assistant Professor, IIT Kanpur** (Feb 2021 - Present)
- **Staff Packaging R&D Engineer & Materials Technologist, Intel Corporation** (Mar 2020 - Feb 2021)
- **Packaging R&D Engineer, Intel Corporation** (Jul 2015 – Mar 2020)
- **Post-Doctoral Research Scholar, Arizona State University (ASU)** (Dec 2014 - Jul 2015)

## JOURNAL PUBLICATIONS

1. **N. Badwe**, S. Wozny, P. Daharwal, T. Rawlings, P. Diglio, M. Renavikar, P. Tadayon, High temperature fatigue and mechanical properties of electrodeposited Ni-based nanocrystalline alloys, **Materialia**, 18, 101136, 2021
2. X. Chen, E. Karasz, **N. Badwe**, K. Sieradzki, Film induced cleavage in stress corrosion cracking of single crystal AgAu alloys, **Corrosion Science**, 187, 109503, 2021
3. **N. Badwe**, X. Chen, D. Schreiber, M. Oltza, E. Karasz, A. Tse, S. Bruemmer, K. Sieradzki, De-coupling the role of stress and corrosion in the intergranular cracking of noble-metal alloys, **Nature Materials**, 17, 887–893 (2018)
4. **N. Badwe**, X. Chen, K. Sieradzki, Mechanical properties of nanoporous gold in tension, **Acta Materialia**, 129, 251-258 (2017)
5. **N. Badwe**, R. Mahajan, K. Sieradzki, Interfacial Fracture Strength and Toughness of Copper/Epoxy-Resin Interfaces, **Acta Materialia**, 103, 512–518, 2016
6. S. Sun, X. Chen, **N. Badwe**, K. Sieradzki, Potential dependent dynamic fracture in nanoporous gold, **Nature Materials**, 14, 894–898, 2015

## CONFERENCE PROCEEDINGS

1. **N. Badwe**, P. Goonetilleke, R. Sidhu, J. Stafford, Thermal cycle and drop-shock performance of homogeneous LTS vs SAC solder joints, SMTA International 2020
2. Y. Fan, T. Dale, Y. Wu, **N. Badwe**, R. Aspandiar, J. Blendell, G. Subbarayan, C. Handwerker, Intermetallic Compound Growth and Gold Embrittlement Effect in Sn-Bi Low Temperature Solders in Contact with Electroless Nickel Emersion Gold (ENIG) Surface Finish, SMTAI International 2020
3. **N. Badwe**, K. Byrd, O. Jin, P. Goonetilleke, Tin-Bismuth low temperature homogeneous second level interconnect solder joint microstructure, reliability, and failure mechanism, SMTA International, Chicago 2019
4. T. Harris, K. Byrd, **N. Badwe**, Root cause and solution to mitigate the hot tear defect mode in hybrid SAC-low temperature solder joints, SMTA International, Chicago 2019

5. A. Prasad, X. Chen, **N. Badwe**, K. Byrd, Low temperature solder paste transfer efficiency characterization and area ratio limits, SMTA International, Chicago 2019
6. **N. Badwe**, S. Cheng, S. Aravamudhan, M. Renavikar, Solder paste: fundamental material property / SMT performance correlation, SMTA International, Chicago 2018
7. S. Sahasrabudhe, S. Mokler, M. Renavikar, S. Sane, E. Brigham, K. Byrd, O. Jin, S. Parupalli, P. Goonetilleke, **N. Badwe**, Low temperature solder – a breakthrough technology for surface mounted devices, IEEE 68th Electronic Components and Technology Conference (ECTC), San Diego 2018

## CONFERENCE PRESENTATIONS

1. **Invited Talk:** K. Sieradzki, X. Chen, E. Karasz, **N. Badwe**, Dynamic fracture and dealloying induced stress-corrosion cracking, TMS 2021
2. Y. Fan, Y. Wu, T. Dale, S. Achar, H. Fowler, **N. Badwe**, R. Aspandiar, J. Blendell, G. Subbarayan, C. Handwerker, Microalloying effects on intermetallic compound growth and mechanical reliability of Sn-Bi solder joints, TMS 2021
3. **Invited Talk:** **N. Badwe**, Future of interconnects: hybrid vs homogeneous low temperature solder joints, Advanced Microelectronic Packaging and Emerging Interconnect Materials Workshop at TMS, San Diego 2020
4. Y. Fan, Y. Wu, J. Blendell, **N. Badwe**, C. Handwerker, A model study of Bi diffusion and intermetallic growth in Sn-Bi low temperature soldering systems, TMS, San Diego 2020
5. **Invited Talk:** **N. Badwe**, Low melting temperature solder and interconnects: looking back to the Bi role in Sn base solder, Electronic Packaging and Interconnect Materials Workshop at TMS, San Antonio 2019
6. **N. Badwe**, Sn-Bi solders overview: material development, Bi supply and SMT impact, LTS Symposium at SMTAI, Chicago 2019
7. **Invited Talk:** Y. Fan, Y. Wu, J. Blendell, **N. Badwe**, C. Handwerker, Thermodynamic and kinetic effects on microstructure evolution in hybrid low temperature solder/high-Sn solder joints, IEEE 6th International Workshop on Low Temperature Bonding for 3D Integration (LTB-3D), Kanazawa, Japan 2019
8. Y. Fan, Y. Wu, J. Blendell, **N. Badwe**, C. Handwerker, A model study of microstructure evolution and Bi diffusion in Sn-Bi low temperature soldering systems, MS&T, Portland 2019
9. **Invited Talk:** K. Sieradzki, **N. Badwe**, X. Chen, E. Karasz, A. Tse, Dealloying induced stress corrosion cracking, TMS, Phoenix 2018
10. X. Chen, K. Sieradzki, **N. Badwe**, Mechanical properties of nanoporous gold, MRS Spring meeting, Phoenix 2016

## BOOK CHAPTER/MAGAZINE ARTICLE

1. R. Aspandiar, **N. Badwe**, K. Byrd, Low temperature lead free alloys and solder pastes, In J. Bath (Ed.), Lead-free Soldering Process Development and Reliability, John Wiley & Sons Inc publisher, (Jul 2020)
2. **N. Badwe**, K. Byrd, O. Jin, P. Goonetilleke, Tin-Bismuth low temperature homogeneous second level interconnect solder joint microstructure, reliability, and failure mechanism, Circuit Assembly Magazine, Feb 2020

## INDUSTRY LIAISON/MENTOR – ACADEMIC RESEARCH PROJECTS

- High Melt – Low Melt Solder Interconnect Structures for SMT Applications, PI: Prof. E. Cotts, Binghamton University, Semiconductor research center (SRC) (2017 – 20)
- Low temperature solder systems – Development and Fundamental Understanding, PIs: Prof. C. Handwerker, Prof. G. Subbarayan, Purdue University, Intel System Integration Strategic Research Sector (SRS) (2018 – 21)
- Reliable Low Temperature Solder Approach,, PIs: Prof. Borgesen, Prof. Dimitrov, Binghamton University, CHIRP Center/Semiconductor research center (SRC) (2020 – 21)

- Development of local degradation index for thermal cycling joints based on pre-crack EBSD analysis, PI: Prof. Tae-Kyu Lee, Portland State University, Intel Corporation Funding (2020 – 21)

## REVIEWER

- Acta Materialia
- Scripta Materialia
- Materials Science and Engineering A (Outstanding reviewer award)
- Journal of Electronic Materials
- Engineering Failure Analysis
- Journal of SMT
- Intel Assembly & Test Technology Journal
- Semiconductor Research Corporation (SRC) - Grant proposals
- Intel System Integration Strategic Research Sector (SRS) - Grant proposals

## ORGANIZATION/ADMINISTRATIVE

- **Student placement committee** MSE department, IITK
- **Associate Editor:** Microelectronics Reliability (Journal)
- **Department Placement Committee**, MSE, IITK, 2021
- **Technical Advisory Committee:** SMTAI 2020
- **Organizer:** Adv. Microelectronic Packaging & Emerging Interconnect Materials Workshop at TMS, San Diego 2020
- **Organizer:** Low Temperature Solder Symposium, SMTA International, Chicago, 2019
- **Organizer:** Materials section, ASME InterPack Workshop, San Jose 2016
- **Session Chair:** TMS, San Antonio 2019, San Diego 2020
- **Session Co-chair:** SMTA International, Chicago 2018, 2019
- **Event Organizer:** PAN-IIT Phoenix Chapter, 2014 - 15

## AWARDS/SCHOLARSHIPS

- **TMG Excellence Award**, Intel Corporation (2018)
- **ATTD and CQN Department Recognition Award**, Intel Corporation (2017, 2019, 2019, 2021)
- University Graduate Fellowship – **Arizona State University** (2008, 2012)
- Among top 3 students (out of 560) selected from IIT Bombay for **Tata steel scholarship** (2007 - 08)
- Among top 3 students from Maharashtra selected for **Hinduja merit cum means scholarship** (2001 - 08)