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Editorial

Editorial for the Special Issue on Small-Scale Deformation using Advanced Nanoindentation Techniques

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Nanoindentation techniques have been used to reliably characterize mechanical properties at small scales for the past 30 years. Recent developments of these depth-sensing instruments have led to breakthroughs in fracture mechanics, time-dependent deformations, size-dependent plasticity, and viscoelastic behavior of biological materials. This special issue contains 11 papers covering a diverse field of materials deformation behavior. Müller et al. [1] developed a new nanoindentation method to evaluate the influence of hydrogen on the plastic deformation of nickel. Effects of radiation on ferritic-martensitic steels were studied by Roldán et al. [2]. The applications of the depth-sensing indentation method in the mechanical reliability of microelectronic packaging products, such as through-silicon via (TSV) structures and lead-free solder, were performed by Wu et al. [3] and Long et al. [4], respectively. Gan et al. [5] and Chiu et al. [6] investigated the fracture behavior of cementitious cantilever beam and InP single crystals. Studies of nanometer scale deformation of metallic glass materials (Zr-Cu-Ni-Al and La-Co-Al alloys) [7] and Bi_2Se_3 thin films [8] were also part of the collected manuscripts. The mechanical deformation of mammalian cells and other biological materials [9,10] were also discussed in this focus issue. Influence of surface pit on the nanoindentation was studied by Zhang et al. [11]. The editors would like to thank these authors for their contributions to this focus issue.

References

1. Müller, C.; Zamanzade, M. The Impact of Hydrogen on Mechanical Properties; A New In Situ Nanoindentation Testing Method. *Micromachines* **2019**, *10*, 114. [CrossRef] [PubMed]
2. Roldán, M.; Fernández, P.; Rams, J.; Sánchez, F.J.; Adrián, G.-H. Nanoindentation and TEM to Study the Cavity Fate after Post-Irradiation Annealing of He Implanted. *Micromachines* **2018**, *9*, 633. [CrossRef] [PubMed]
3. Wu, C.; Wei, C.; Li, Y. In Situ Mechanical Characterization of the Mixed-Mode Fracture Strength of the Cu/Si Interface for TSV Structures. *Micromachines* **2019**, *10*, 86. [CrossRef] [PubMed]
4. Long, X.; Zhang, X.; Tang, W.; Wang, S.; Feng, Y.; Chang, C. Calibration of a Constitutive Model from Tension and Nanoindentation for Lead-Free Solder. *Micromachines* **2018**, *9*, 608. [CrossRef] [PubMed]
5. Gan, Y.; Zhang, H.; Šavija, B.; Schlangen, E. Static and Fatigue Tests on Cementitious Cantilever Beams Using Nanoindenter. *Micromachines* **2018**, *9*, 630. [CrossRef] [PubMed]
6. Chiu, Y.; Jian, S.; Liu, T.; Le, P.H.; Juang, J. Localized Deformation and Fracture Behaviors in InP Single Crystals by Indentation. *Micromachines* **2018**, *9*, 611. [CrossRef] [PubMed]
7. Ma, Y.; Song, Y.; Huang, X.; Chen, Z.; Zhang, T. Testing Effects on Shear Transformation Zone Size of Metallic Glassy Films Under Nanoindentation. *Micromachines* **2018**, *9*, 636. [CrossRef] [PubMed]

8. Lai, H.; Jian, S.; Thi, L.; Tuyen, C.; Le, P.H.; Luo, C. Nanoindentation of Bi_2Se_3 Thin Films. *Micromachines* **2018**, *9*, 518. [CrossRef] [PubMed]
9. Qian, L.; Zhao, H. Nanoindentation of Soft Biological Materials. *Micromachines* **2018**, *9*, 654. [CrossRef] [PubMed]
10. Moussa, H.; Logan, M.; Wong, K.; Rao, Z.; Aucoin, M.; Tsui, T. Nanoscale-Textured Tantalum Surfaces for Mammalian Cell Alignment. *Micromachines* **2018**, *9*, 464. [CrossRef] [PubMed]
11. Zhang, Z.; Ni, Y.; Zhang, J.; Wang, C.; Ren, X. Multiscale analysis of size effect of surface pit defect in nanoindentation. *Micromachines* **2018**, *9*, 298. [CrossRef] [PubMed]