

# EFFECT OF SURFACE CONTACT ON HEAT-INDUCED MORPHOLOGICAL CHANGES IN SILVER NANOWIRES

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Growing demand for transparent and flexible electronic devices in the world in recent decades has caused researchers to tend to optimize the electrical, mechanical, and optical properties of materials for these applications. One of the most useable kinds of materials in that field are metallic nanowires (NWs) and especially Ag NWs because of their special electric and physical properties. Optimization and achieving stable working conditions for NWs, especially Ag NWs are important to realize the great potential for Nano-Micro electromechanical systems and electronic applications [1,2]. In this study, we investigated the role of the substrate and environment in heat-induced morphological changes in Ag NWs. We deposited Ag NWs on specially patterned silicon substrates so that many NWs are partially suspended over the structures in the substrate. This creates a condition when long Ag NWs have several parts that are in tight contact with Si substrate by one facet, while several parts have all five facets free. Two different heating schemes were used which had different results. The transmission electron microscopy results showed that there was no change in atomic structure of NWs after heat-induced fragmentation. This confirms that fragmentation happens via diffusion without involving melting of NWs. To understand the reasons behind the different behaviors of the NWs in the two schemes, we performed finite element method and molecular dynamics simulations. Our findings provide insights into the effects of substrate on the morphological changes of Ag NWs during heat treatment and have important implications for the development of flexible and transparent conductive materials.

## References

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