

Engaging undergraduate students in heterogeneous nanomaterials research at a primarily undergraduate institution

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Experimental research is an important complement to classroom-based undergraduate education. It fosters an appreciation for the scientific process by linking what is learned in the classroom with the hands-on laboratory experience. Performing research alongside a faculty mentor helps undergraduate students better understand design of experiments, interpretation of data, exploration of the literature, communicating results, and teamwork. This presentation describes heterogeneous nanomaterials research by undergraduate students at a Primarily Undergraduate Institution. Heterogeneous copper-silver nanoparticles were synthesized using microwave irradiation technique which has been shown to shorten reaction time and enhance reaction control. The morphology of the nanoparticles was influenced by the reaction temperature and the sequence of reducing the reaction precursors. When silver ions were reduced on copper nanoparticles seeds at hydrothermal temperature, spherical nanoparticles were formed whereas concurrent reduction of copper ions and silver ions at identical hydrothermal temperature produced shaped nanoparticles. Results from characterization of the optical, size, morphological, and composition of the nanoparticles using ultraviolet-visible (UV-vis) spectroscopy, scanning transmission electron microscopy, and X-ray photoelectron spectroscopy will be discussed. Implications of the results to the design of multifunctional nanoparticles will also be discussed.