RX17-17

Optimization of a high-strength, cold-workable wear-resistant alloy

1. **Research Title:** Optimization of a high-strength, cold-workable wear-resistant alloy
2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level:** *Materials Science and Engineering, Physical Metallurgy and Microstructure Characterization* (Masters or Ph.D. level)
4. **Objectives:** *The objective of this research is to develop a fundamental understanding of the deformation mechanisms giving rise to the high strength and wear-resistance of the Cu-Ni-Sn alloy system in order to optimize their composition and microstructure.*
5. **Description:** *Cu-Ni-Sn alloys derive strength from a spinodal hardening mechanism which has been shown to be significantly enhanced by cold working. The fundamental reasons for the strengthening and its impact on material hardening behavior remain unclear, however, this knowledge would be extremely valuable to the development of new compositions in this alloy system and also for the development of temper treatments. Due to the range of important length scales, including the near-atomic scale of the spinodal reaction, advanced electron microscopy tools (SEM, TEM, EDS, EELS, EFTEM, HR-STEM, HAADF-STEM, 3DAP, etc) will be required for this research to document composition-microstructure-property relationships in high-strength Cu-Ni-Sn alloys. Samples of various compositions will be prepared and processed by typical wrought metallurgy routes to achieve uniform grain size. Samples of each composition will be subjected to different degrees of cold work followed by tension testing. Finally, the dislocation-microstructure interactions will be documented and related to local chemistry.*
6. **Research Classification/Restrictions:** *There are no anticipated restrictions for this research.*
7. **Eligible Research Institutions:** Indicate to what organizations this topic should be provided.

☒ DAGSI (Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati)

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