

NANO HIGHLIGHT

A Welding Filler Reinforced with Nanoparticles for Aerospace Structures

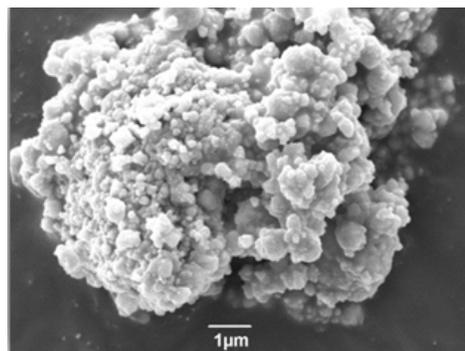
NSF Grant 1345156

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In the quest for cost-efficient processes for aerospace structures, a new filler for tungsten inert gas (TIG) welding of aluminum structures was developed using nanoparticles as reinforcements [1]. This aluminum-based nanocomposite becomes an appealing alternative to commercial aluminum alloy fillers with lower thermal expansion coefficient and adjustable electrical resistivity to attain reasonable welding temperatures. This breakthrough technology is based on years of development at the University of Puerto Rico of new aluminum matrix composites reinforced with diboride particles [2,3]. Further development even led to a US patent [4]. This permitted a better understanding of the processing techniques needed to fabricate wires reinforced with nanoparticles with adjustable electrical resistivity and melting temperatures without significantly modifying the chemical composition [5,6].

Nowadays, the developers of these novel fillers are working on optimization parameters dealing with: a) proper adjustment of the nanoparticle size and distribution in the wire; b) stir melting of the wires' parent composite; c) wire annealing and cold working; d) alternative alloying with minor additions of metals forming solid solutions with aluminum. One important operational benefit is that no new TIG welding methods need to be developed, as the fillers are designed to be interchangeable with competing commercial ones. Thus, this welding material can raise the standards of quality tools and infrastructure. Once fully operational, the novel filler not only would meet tight aerospace specifications but also expands the range of possibilities of new derivative technologies. In summary, the new material assists in providing improved operational efficiency in aerospace structure technology.



Secondary electron image of preprocessed metal diboride cluster used in the nanocomposite filler.

References

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