

Processing of Aluminum Nickelides by Hot Explosive Consolidation

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Two series of nickel (Ni)-coated aluminum (Al) powder compositions were consolidated to full or near-full density by hot explosive compaction. Mixtures of 78Al-22Ni at.% (63Al-37Ni wt.%) or 39Al-61Ni at.% (23Al-77Ni wt. %) were placed in cylindrical containers, preheated to a range of temperatures from ambient to 1,000°C, and upon reaching a uniform temperature, explosively compacted into rod-shaped billets using a cylindrical detonation arrangement. It was found, that depending on the preheating temperature, the initial Ni-coated Al composition transformed sequentially and partitioned into several aluminum nickelide (Al-Ni) intermetallics. Scanning electron microscopy, energy dispersive x-ray spectroscopy, and x-ray diffraction measurements were used to reveal the nature of the resultant intermetallics. The onset and nature of the transformation from the precursors into the products were further studied by differential thermal analysis. These results and the role of the explosive consolidation wave on the transformation are discussed.