

Cermet/Intermetallic Joining by Centrifugal Combustion Synthesis

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A centrifugal combustion synthesis process was applied to join a Ni-Al alloy and a Ni-TiC or Ni-Al₂O₃ cermet. The cermet, a graphite mold with a pipe trunk, and a green compact of reactants consisting of Al, Ni, and NiO were set into a centrifugal caster. When the combustion synthesis reaction was induced in the centrifugal force field, synthesized molten Ni-Al alloy flowed into the mold and deposits on the cermet. The soundness of the joint depended on the type and volume percentage of the ceramic phase in the cermet. The joint of Ni-TiC/Ni-25 mol% Al was most sound (i.e., perfect) when the volume percentage of TiC was 25% or less. In contrast, it was found that the Ni-Al₂O₃/Ni-25 mol% Al joint had many defects even when the volume percentage of Al₂O₃ was 10%. We overcame this difficulty by using a functionally graded cermet such as Ni/Ni-10vol.%Al₂O₃/Ni-25vol.% Al₂O₃.