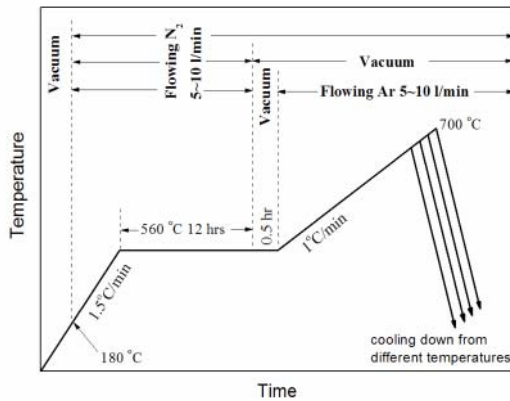


The effect of infiltration atmospheres on the infiltration behaviours of aluminium alloy parts fabricated by rapid prototyping

Peng Yu, Ma Qian and G.B. Schaffer

The University of Queensland, School of Engineering,
ARC Centre of Excellence for Design in Light Metals, Qld 4072, Australia



Preform preparation:

- ❖ Mixing Al 6061-2%Mg-1%Sn-3%Nylon powders
- ❖ Selective laser sintering the mixture to form green parts
- ❖ Nitriding the green parts at 560°C for 12 hrs to form AlN skeleton

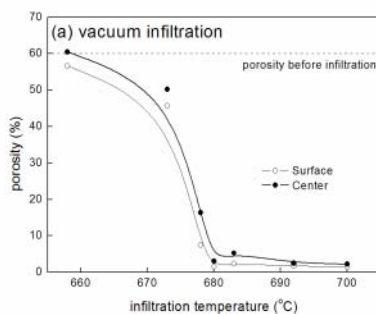
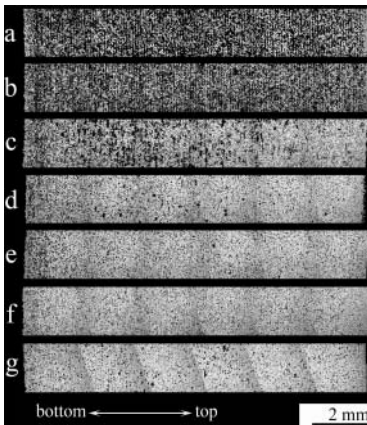
Infiltration procedure:

- ❖ Infiltrating with Al 6061 alloy under vacuum, nitrogen or argon to different temperatures
- ❖ Cooling down to room temperature inside the furnace

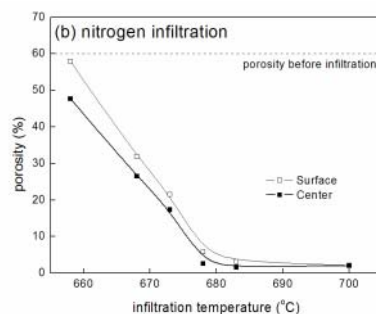
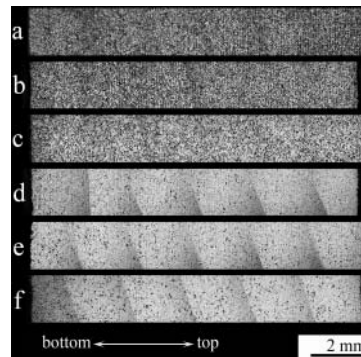
Characterization methods:

- ❖ Microstructures were observed by use of an optical microscope
- ❖ Optical micrographs were further processed by use of a professional image analysis software

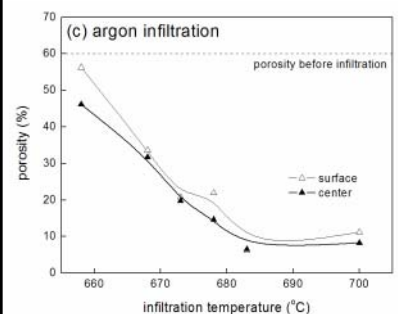
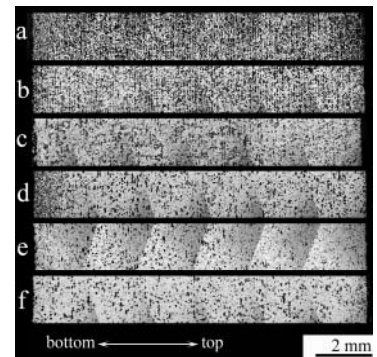
Vacuum infiltration



Nitrogen infiltration



Argon infiltration



Conclusions:

1. When the nitrided Al 6061-2%Mg-1%Sn-3%Nylon preforms are infiltrated by the Al 6061 alloy, the pathway through which the infiltrant penetrates the preform is greatly influenced by the infiltration atmosphere.
2. Under vacuum, the infiltrant fills the interior of the preform first and then propagates to the surface.
3. Under nitrogen or argon, the infiltrant penetrates along the surface prior to filling the interior.