

Replication

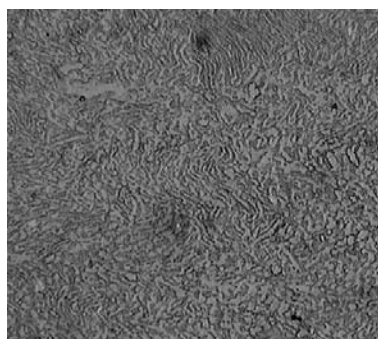
NDT Inspection Process Tech Brief

Process Overview

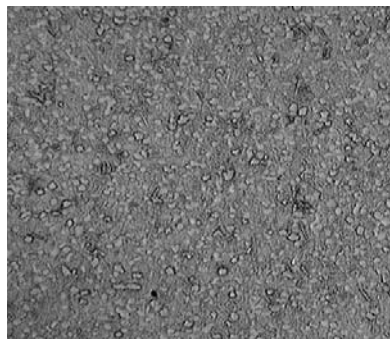
Replication is a follow-on inspection technique to assist in further evaluating surface indications. It is commonly used as a follow-up to Blue Etch Anodize (BEA) on titanium to enhance a material segregation indication. The need for replication is determined by first detecting an indication visually (1X) followed by a customer requirement for further investigation (otherwise part is just tagged as defective).



Alpha Indication via Blue Etch Anodize



Replication of Alpha Indication Area
Primary Alpha Stringer Noted



Replication of Adjacent Normal Area
(Much more uniform, stringers absent)

Replication Process Steps

Polishing

Replication is performed on a small area of a part, beginning with polishing the area.

Etching

The area is then locally etched to open grain surfaces.

Film Application

Next, an acetate film is placed on the etched surface.

Film Processing

The film is then wetted with acetone to liquefy and allow it to sink into the grain cavities.

Film Development

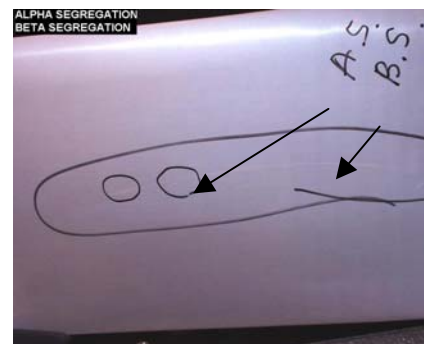
The film re-hardens after drying and is peeled from the surface. The replication is a mirror condition of the grain contour (i.e., valleys appear as mountains).

Magnification & Evaluation

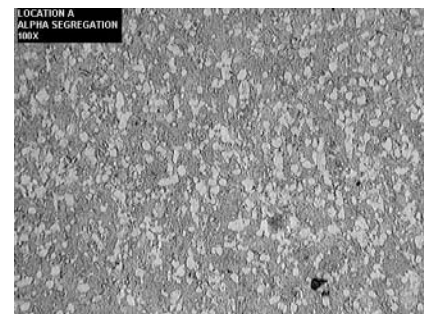
The replication is then visually examined under magnification. In the case of a titanium Alpha condition, the hardened Alpha does not etch relative to non-segregated material. Hence, Alpha is a relative mountain on the part's surface, and appears as a valley on the replication film. As a thinner material, it appears lighter on the replication.



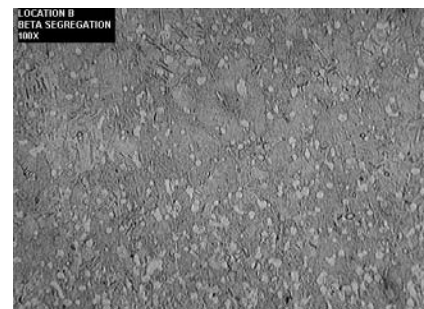
Replication Analysis Workcell



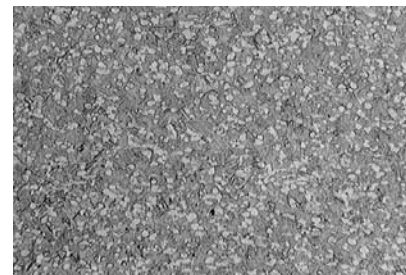
Blade with Both Alpha and Beta Segregation



Alpha Indication Area
(white grains are Alpha)



Beta Indication Area
(note lack of Alpha)



Normal Area of Part

Note all part photos are without magnification.
Replication outputs are magnified 100X.

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