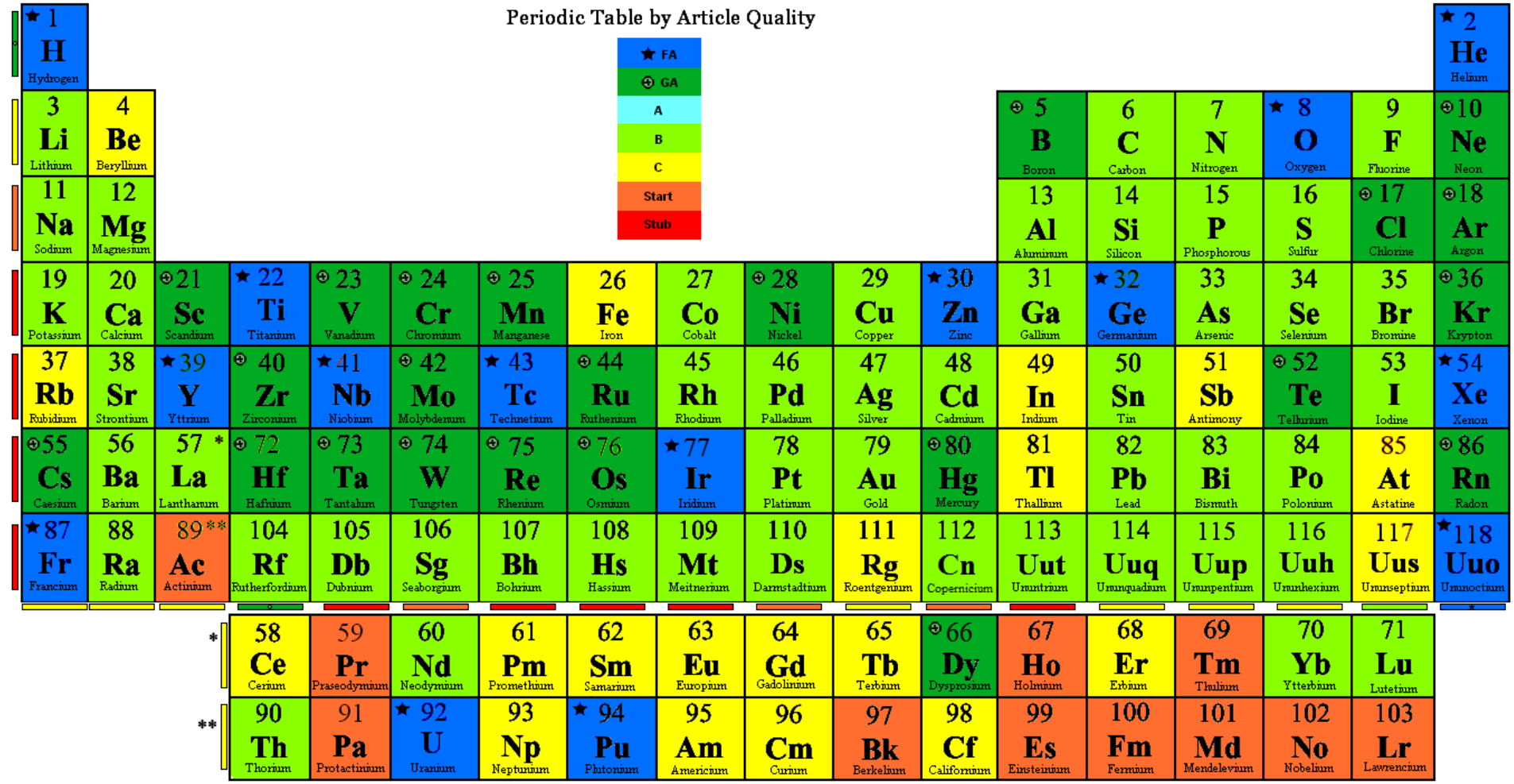
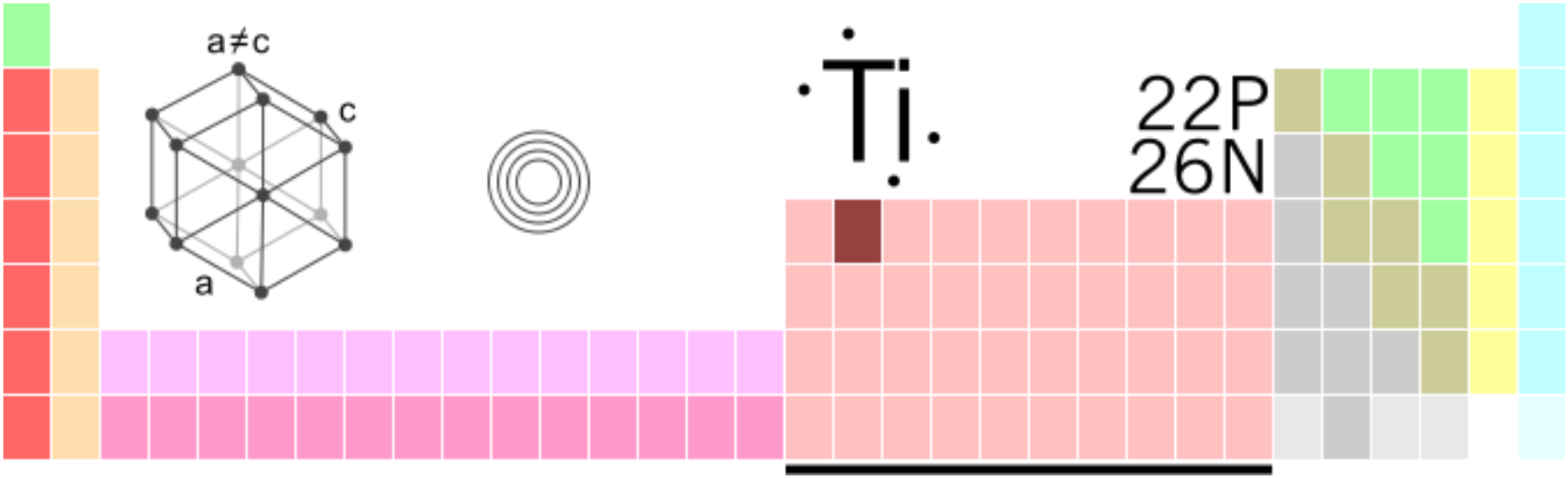
TITANIO Y SUS ALEACIONES

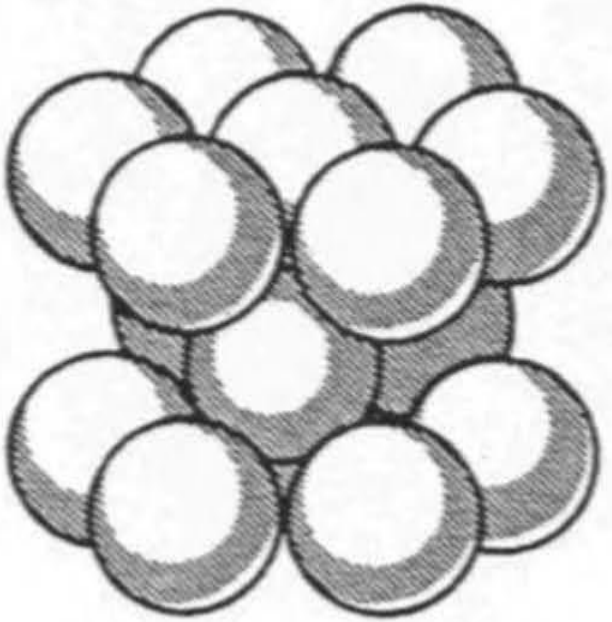
Julio Alberto Aguilar Schafer

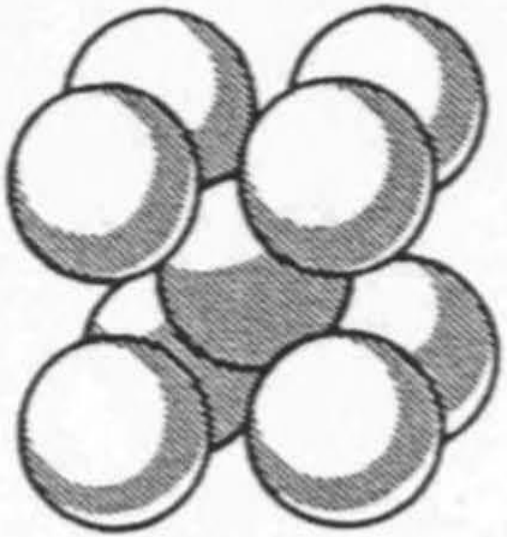
Tabla periódica




a≠c
c
a
Ti
22P
26N

Transformación Alotrópica 880ºC
β-Transus





Hexagonal compacta

Fase α –HCP

BCC

Fase β

ALEACIONES β

Omitir la formación de fase ω

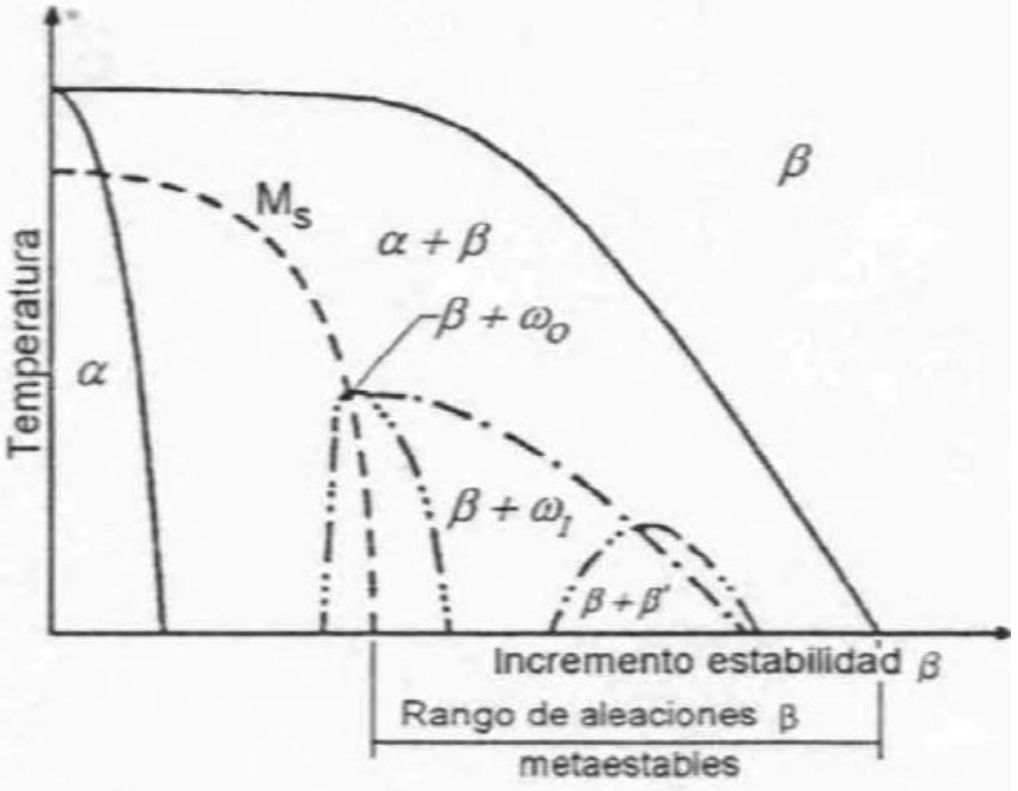


Fig. 2.11 Tratamientos térmicos en aleaciones β

Ti-13V-11Cr-3Al
Ti-8Mo-8V-2Fe-3Al [Ti-8823]
Ti-15V-3Sn-3Cr-3Al [Ti-15-3-3-3]

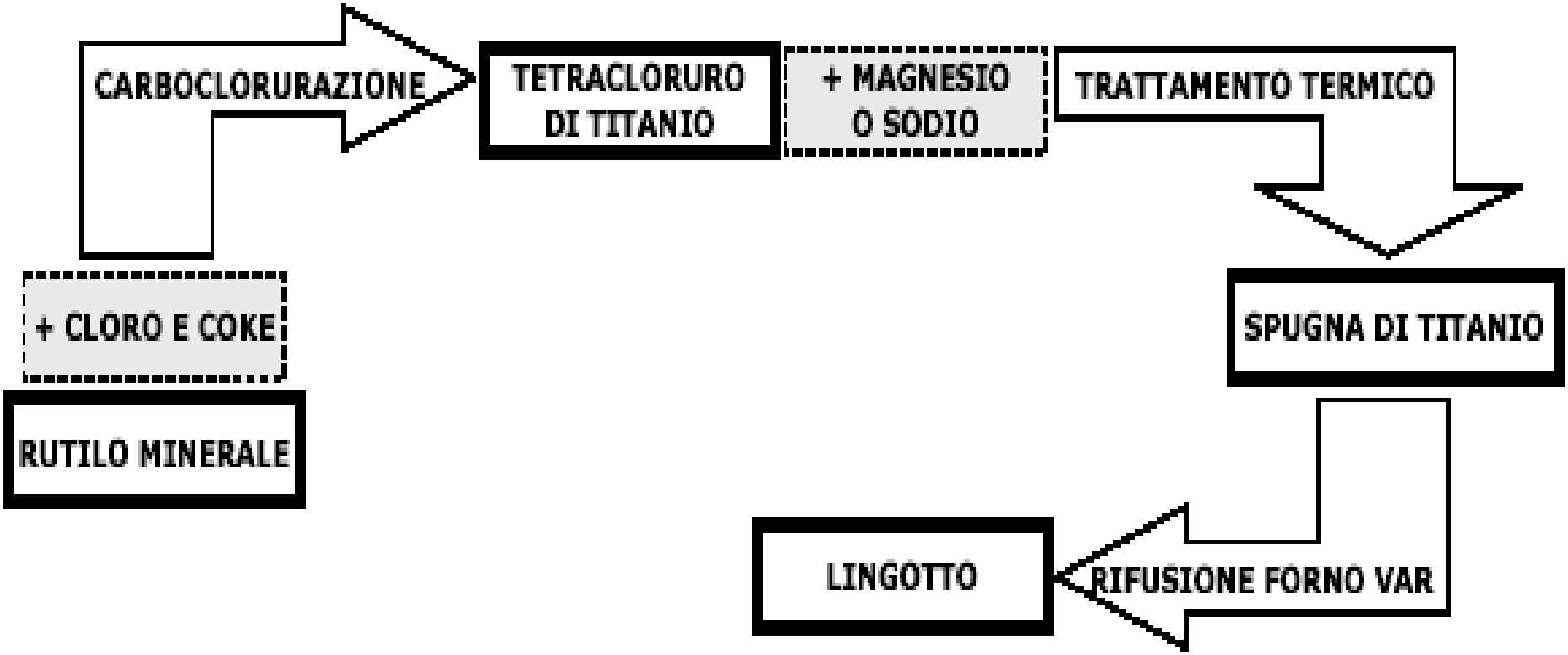
Minerales de Titanio

Se encuentra como óxido en minerales:

- **Ilmenita ($FeTiO_3$)**
- **Rutilo (TiO_2)**
- **Esfena ($CaO \cdot TiO_2 \cdot SiO_2$)**

$$2TiFeO_3 + 7Cl_2 + 6C\ (900°C) \rightarrow 2TiCl_4 + 2FeCl_3 + 6CO$$

$$TiCl_4 + 2Mg\ (1100°C) \rightarrow 2MgCl_2 + Ti$$



Aplicaciones

- En aleaciones como substituto del aluminio
- Aleado con aluminio y vanadio en aeronáutica
- Motores a reacción
- En ingeniería aeroespacial
- En medicina
- Industria alimenticia

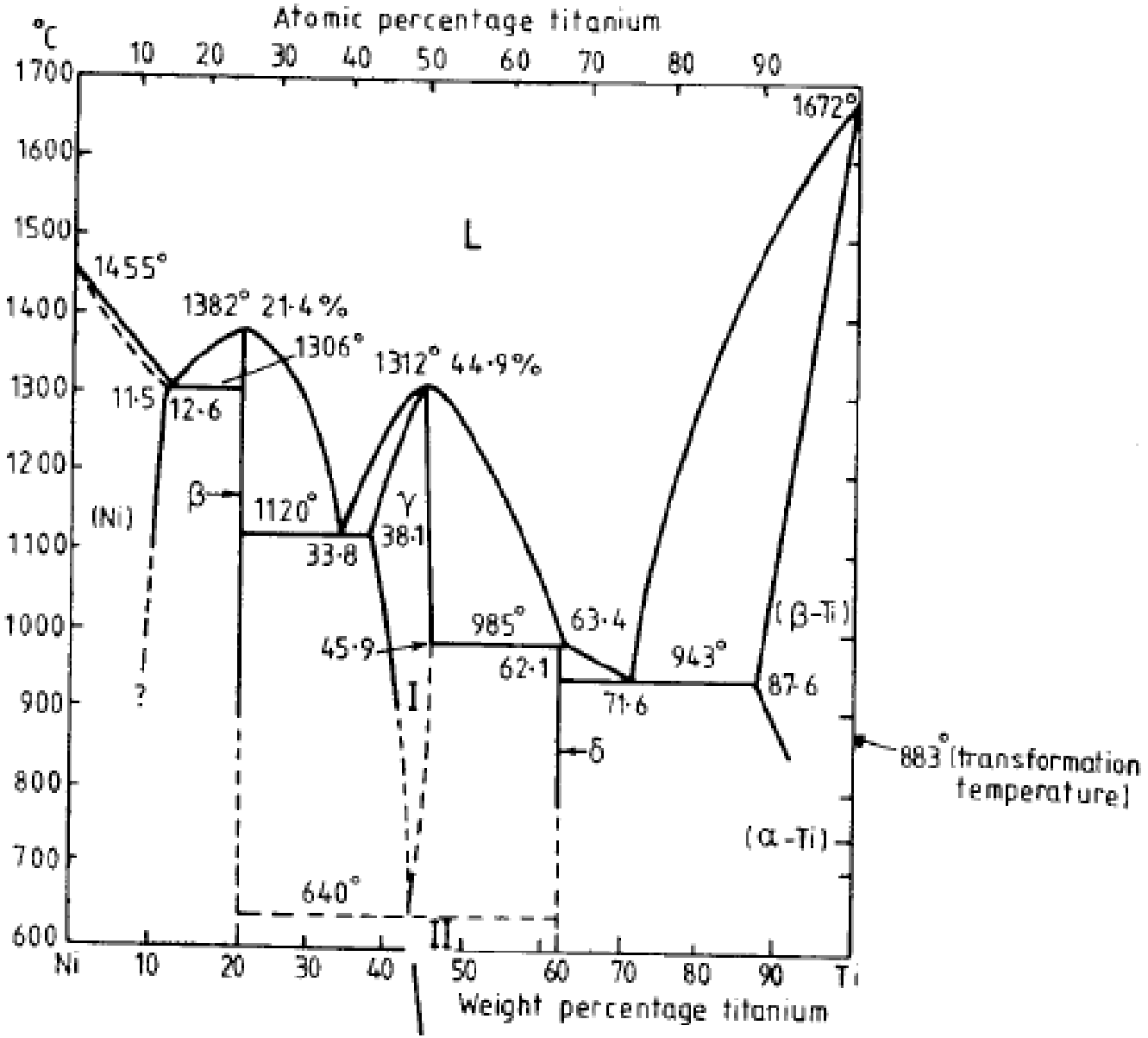
Aplicaciones

- Plantas de desalinización
- En metalurgia
- Pigmentación
- Chips de ordenadores
- Creación de polímetros
- Gemas

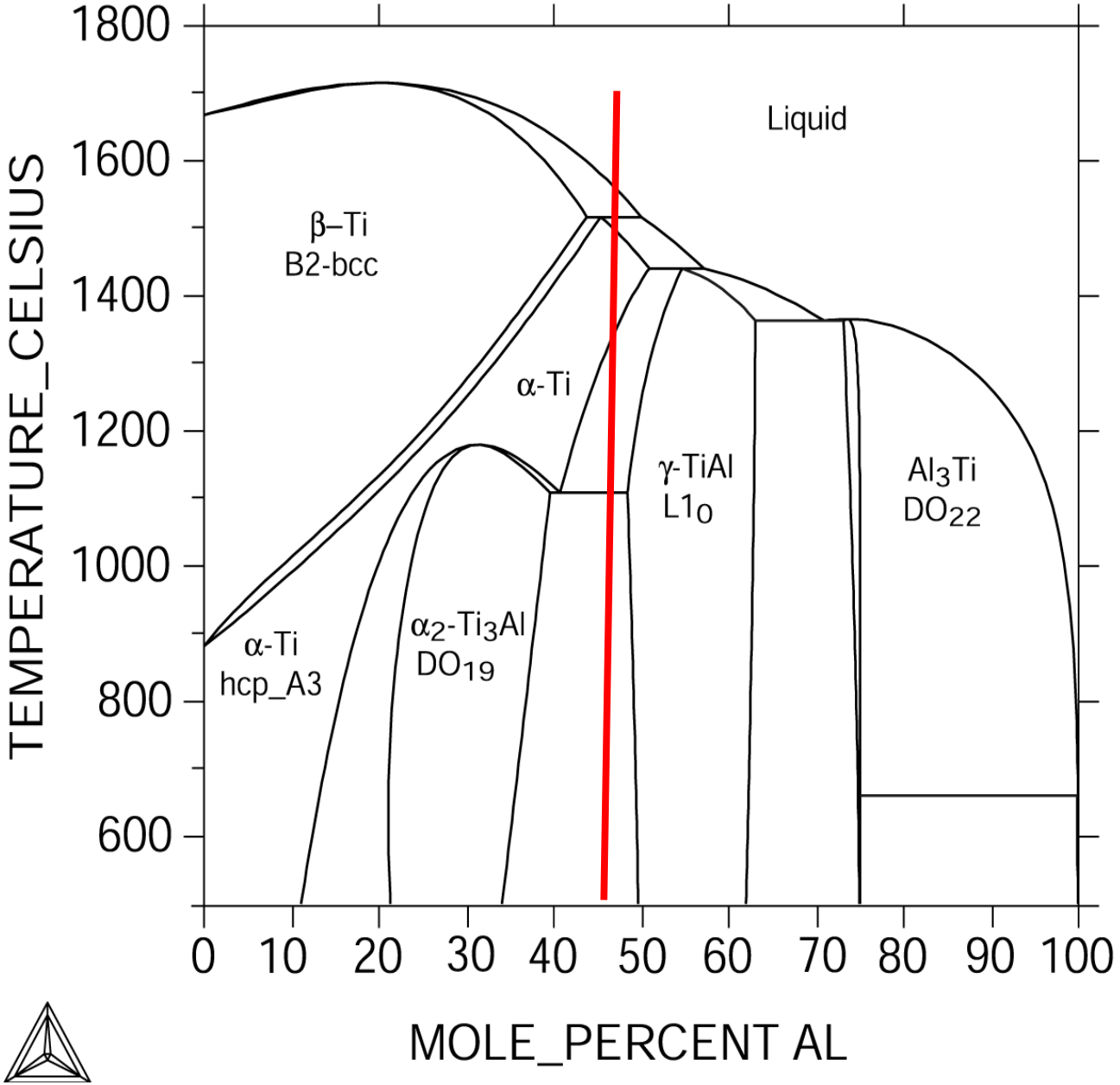
Aleaciones comunes

- Titanio, aluminio y vanadio
- Ferrocarbono titanio
- Cuprotitanio
- Manganotitanio
- Titanio, aluminio y berilio
- Titanio, cobre y níquel
- Nitrurotitanio

Diagrama Ti-Ni



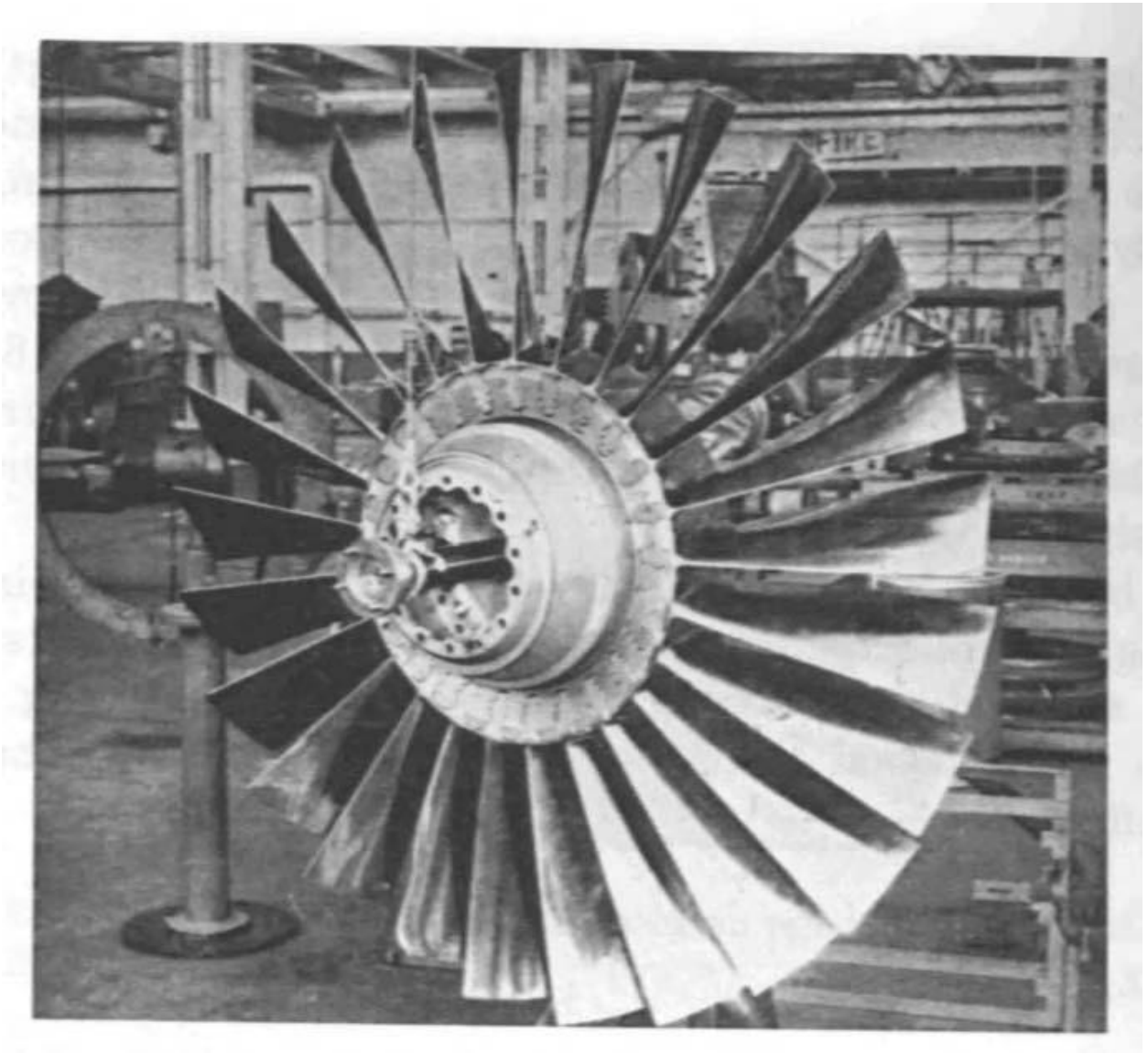
Superaleación TiAl

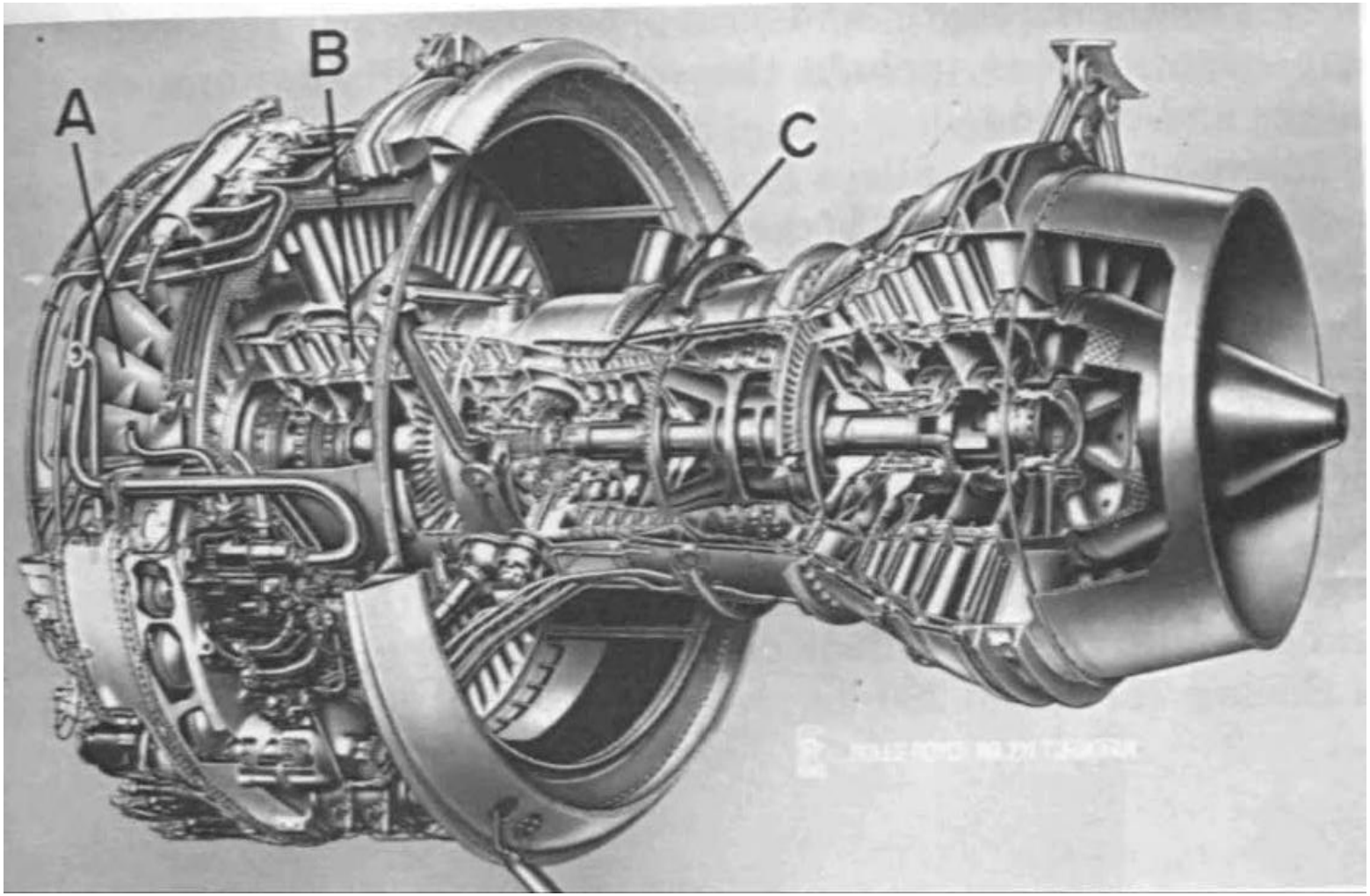


Ti-Al45-Nb8-C0.2-B0.2: ERDA–Messung [at%]

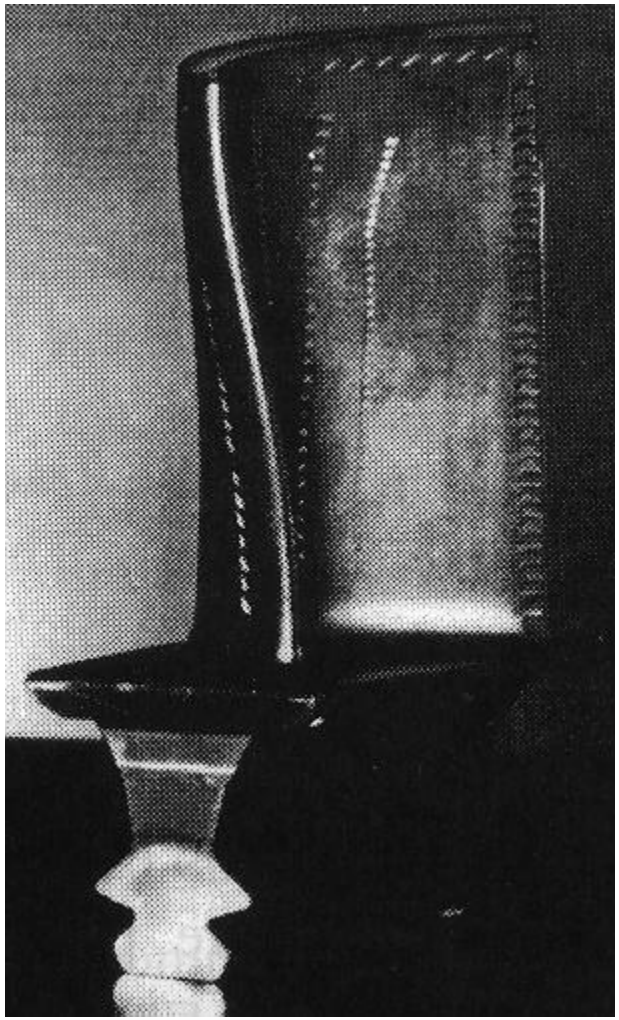
Ti	**47.9**
Al	**43.6**
Nb	**7.5**
C	**0.2**
B	**0.2**
O	**1.2**
N	**0.06**
H	**0.4**

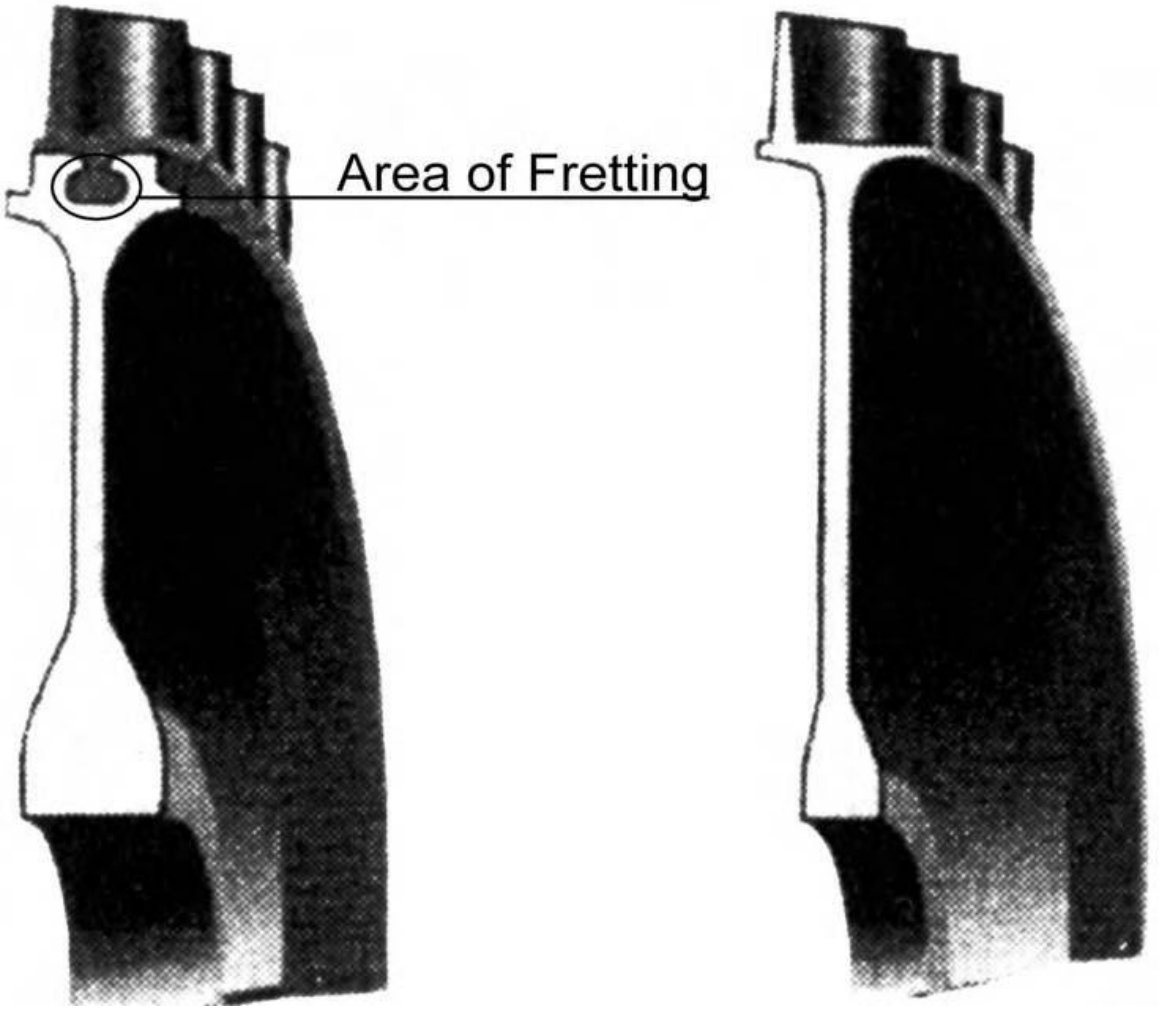
APLICACIONES



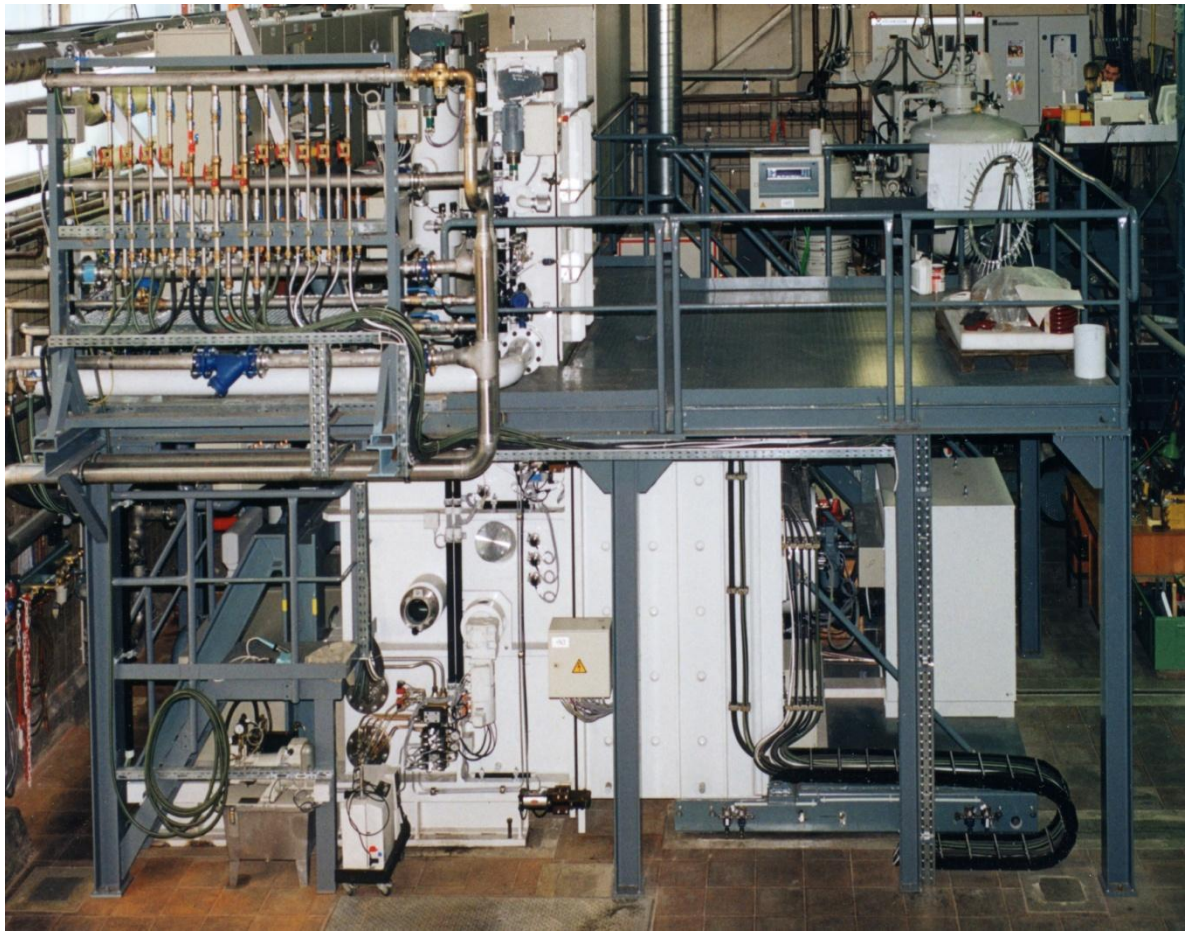


Sección de un modelo de una turbina a gas. (Rolls Royce RB 211)
A. Álabes
B. Compresor de baja presión
C. Compresor de presión intermedia



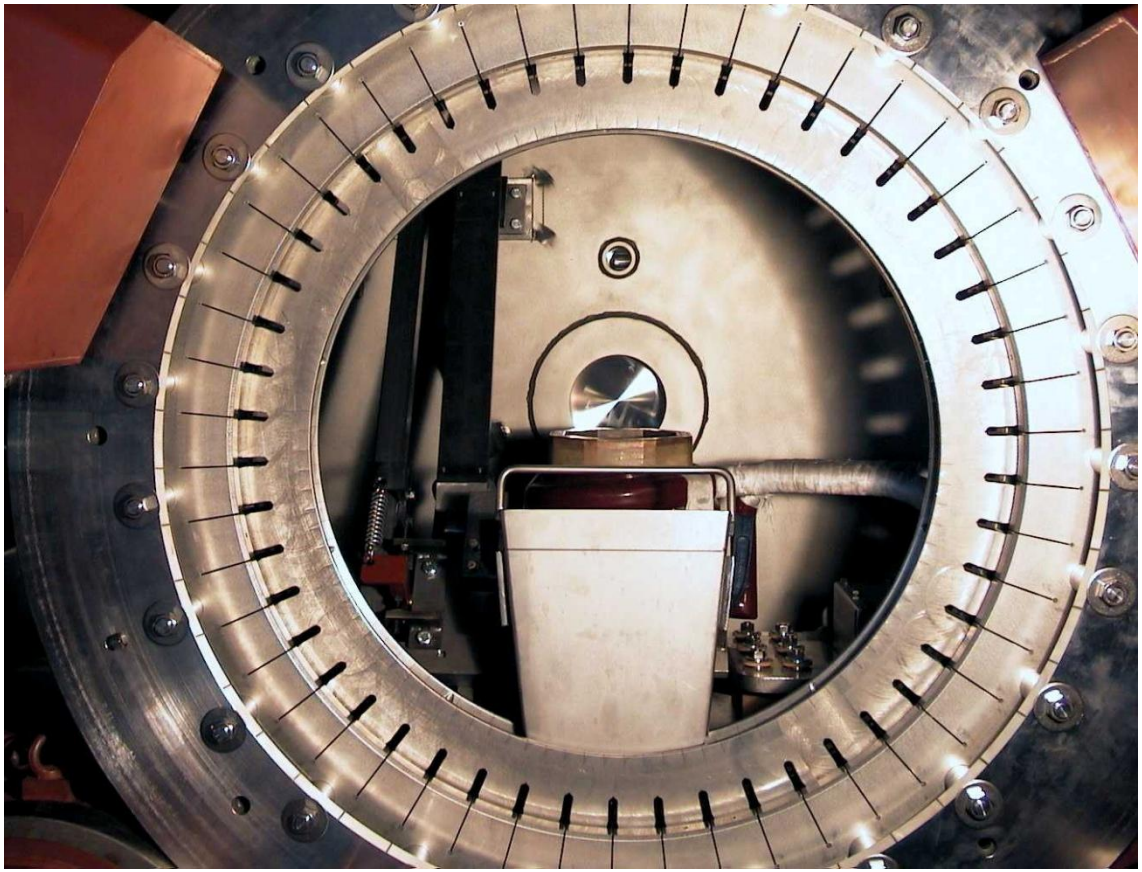

Area of Fretting

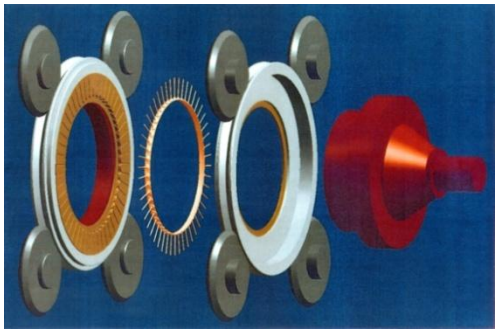
Pilotanlagen zur Serienfertigung von TiAl-Bauteilen



- **Jahreskapazität:**
  600.000Stk
- **Platzbedarf:**
  150qm
- **Anschlussleistung:**
  1MW
- **Betrieb:**
- **1 Person**

Pilotanlagen zur Serienfertigung von TiAl-Bauteilen

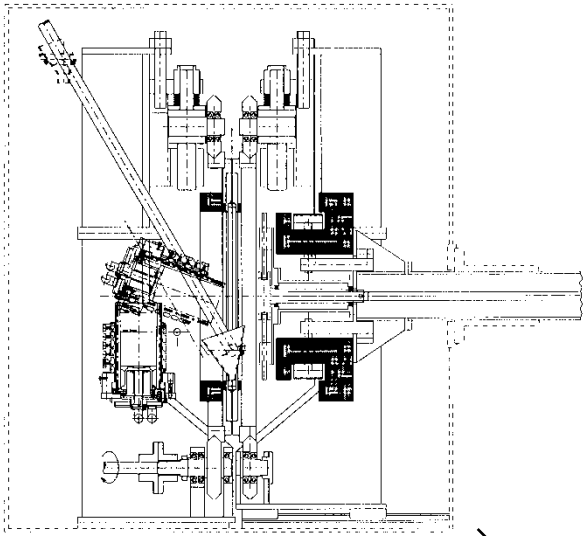


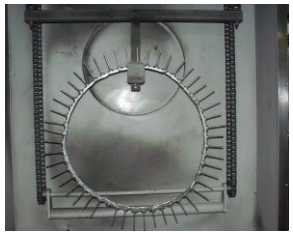


- 2teiliges Kokillengießrad
- Automatische
- r Betrieb
- 50 Ventile
- 30 min Einrichtzeit

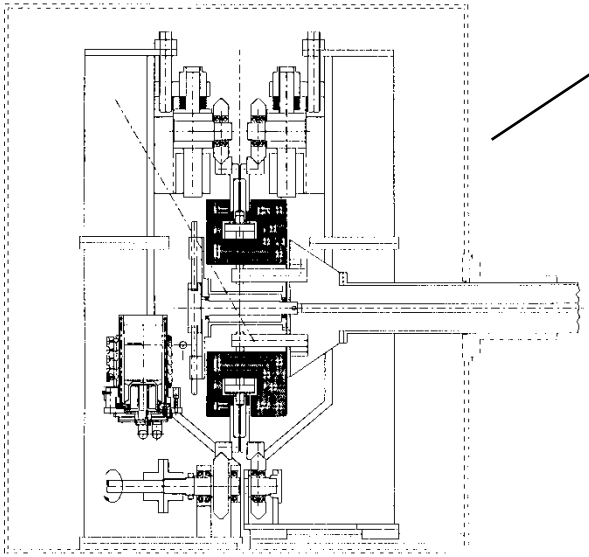
Pilotanlagen zur Serienfertigung von TiAl-Bauteilen

Giessen

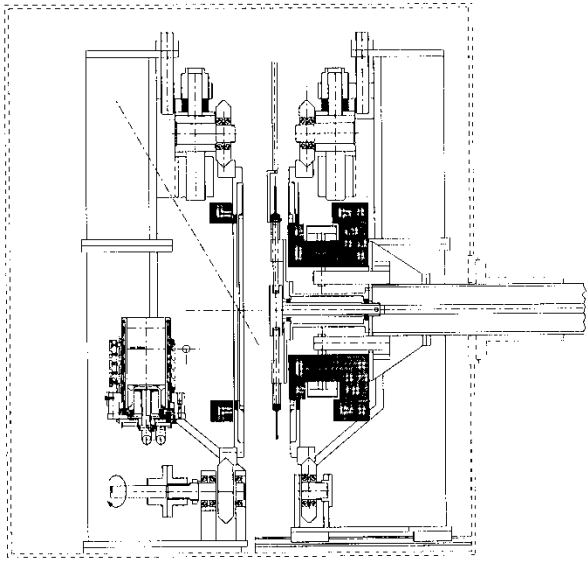




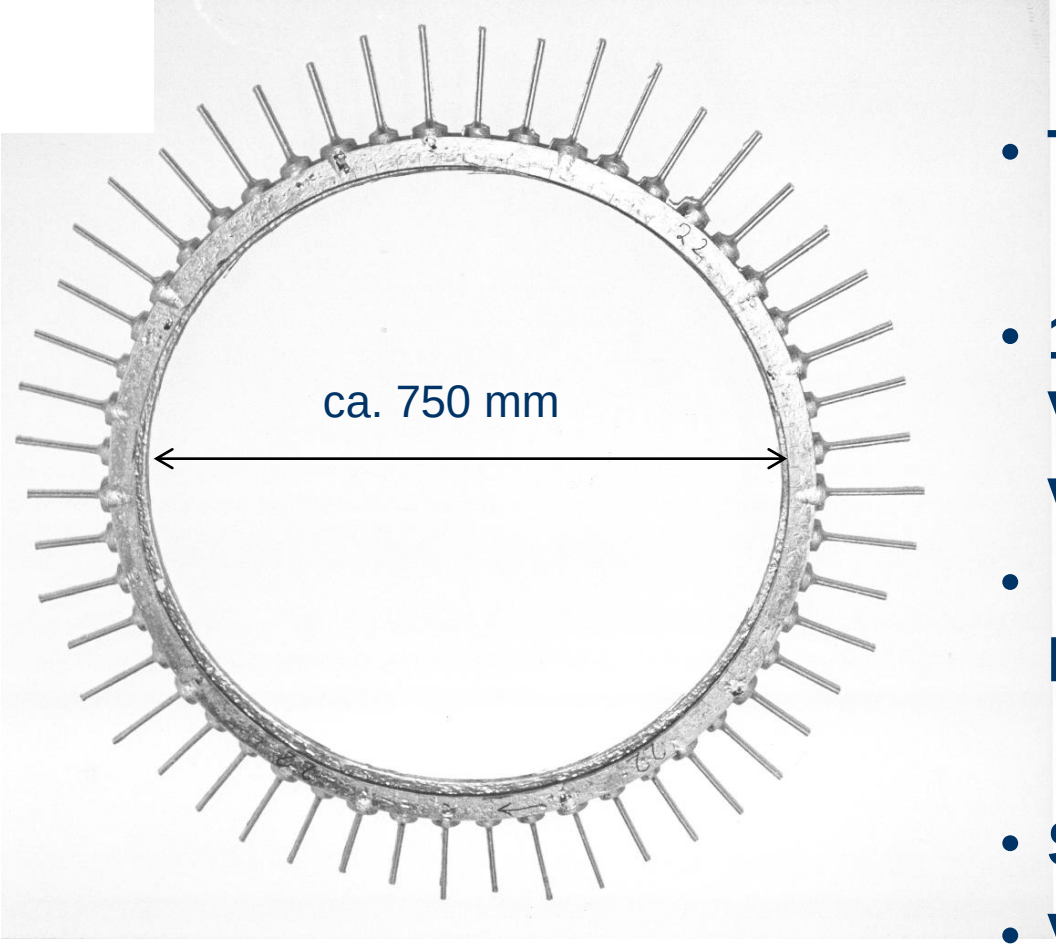
Heizen



Produktionsschema



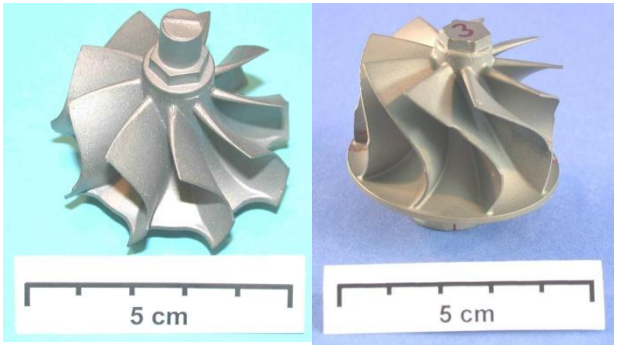
Pilotanlagen zur Serienfertigung von TiAl-Bauteilen

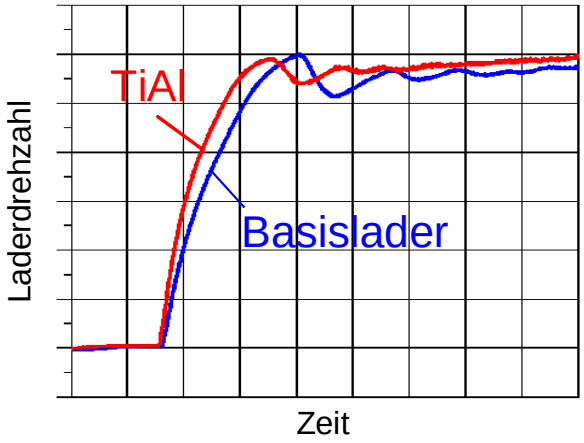


- **TiAl-Gießkranz**
- **10 verschiedenen Ventilgeometrien von**
- **AUDI, BMW, FORD, OPEL, VW**
- **Schaft-Ø = 5-7mm**
- **Ventillänge= 80 – 120 mm**

Schleudergussverfahren für TiAl – Feingussbauteilen

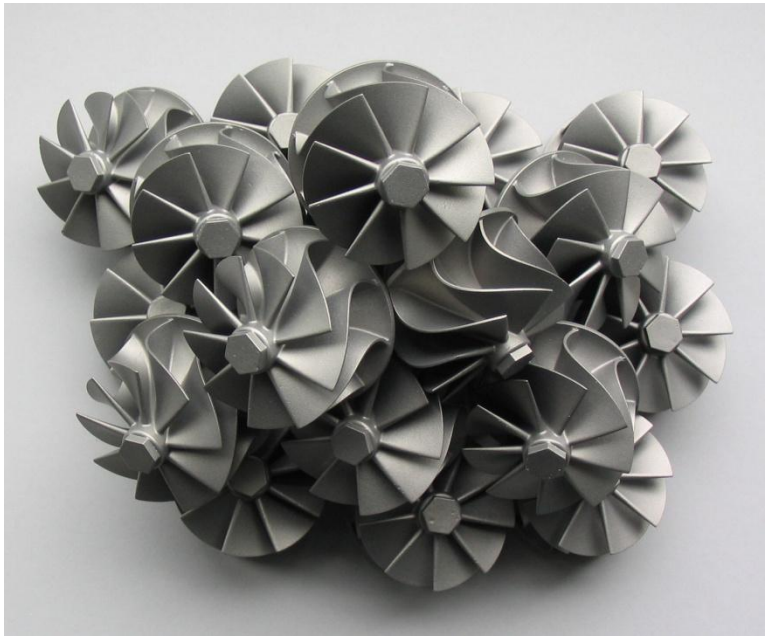
- **Abgasturboladerräder**



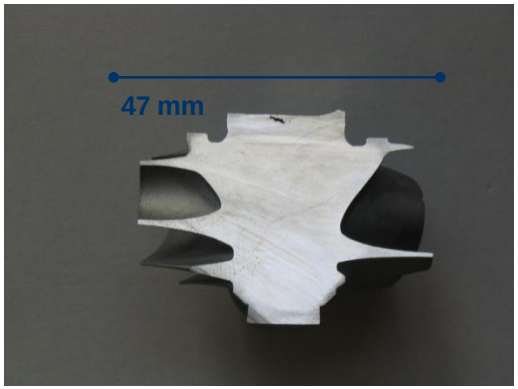


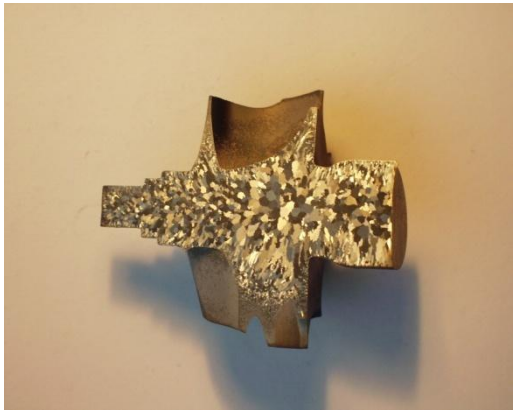
BMBF-Projekt DC, GFE, GKSS, ACCESS

Schleudergussverfahren für TiAl – Feingussbauteilen

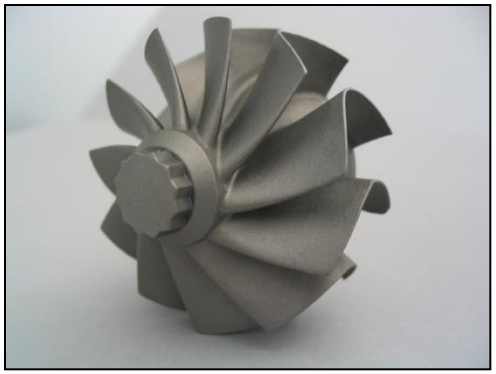


Diesel ATL TiAl TNBV5

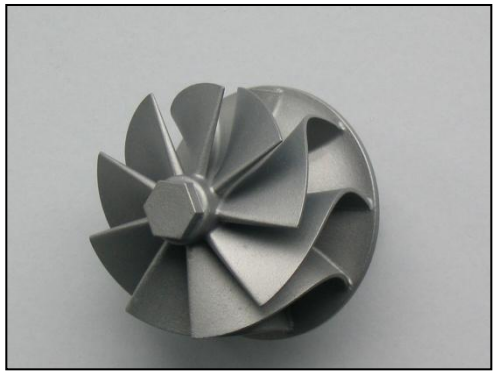




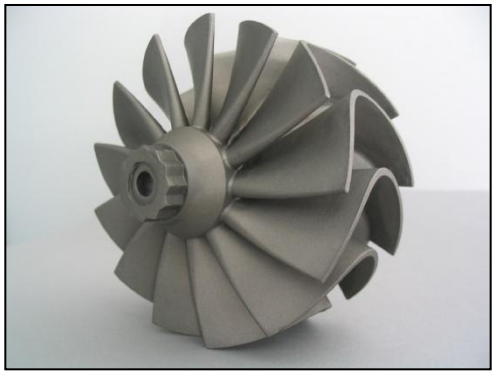
Schleudergussverfahren für TiAl – Feingussbauteilen



ATL für Ottomotor (PKW)
Durchmesser: 46 mm
Bauteilgewicht: 60 g
Flügelstärke: 0.4 mm



ATL für Dieselmotor (PKW)
Durchmesser: 47mm
Bauteilgewicht: 80 g
Flügelstärke : 0.7 mm



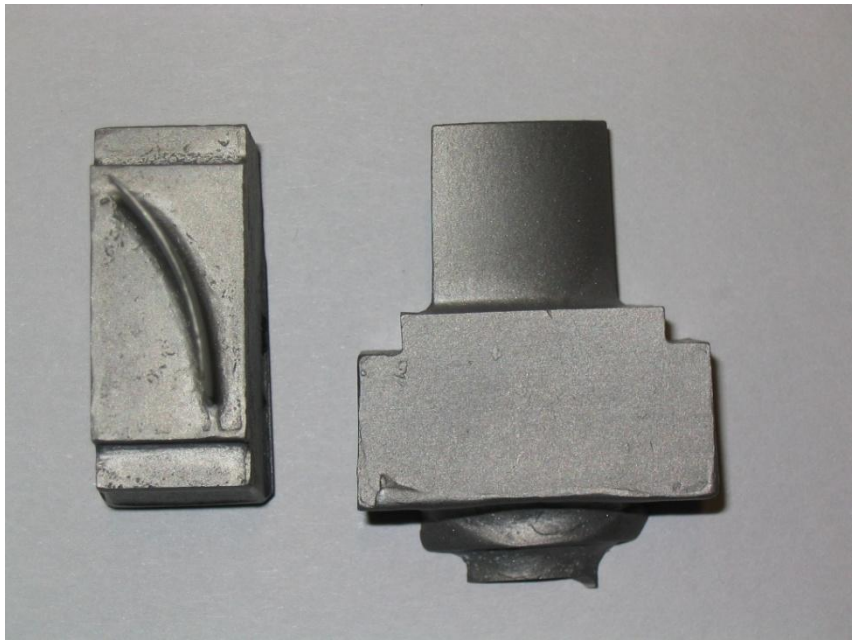
ATL für Dieselmotor (LKW)
Durchmesser: 75 mm
Bauteilgewicht: 370 g
min. Flügelstärke : 1,7 mm

Schleudergussverfahren für TiAl – Feingussbauteilen

230 mm

ND-Turbinenschaufel aus TiAl

Schleudergussverfahren für TiAl – Feingussbauteilen



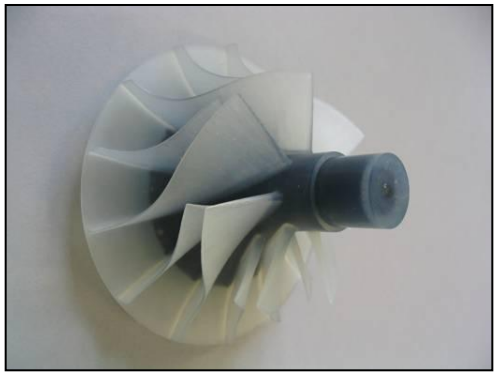
Statorblätter aus TNBV5 für Triebwerkskompressoren

Gewicht: 12 g

Blattstärke: 0,5 – 1 mm

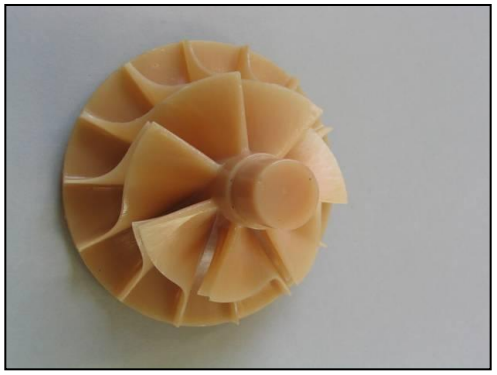
Bauteildimenson: 20x 20 mm

Schleudergussverfahren für TiAl – Feingussbauteilen



SLS - Modell

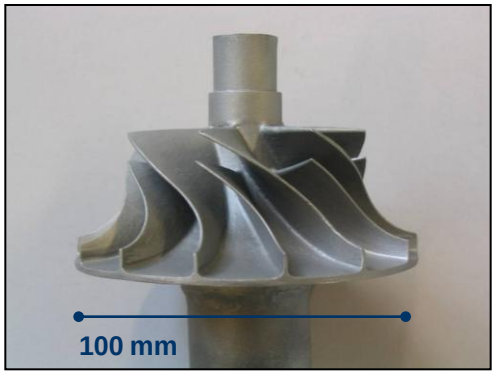
PU-Matrize



Wachsling

Formschale

Schleudergießanlage



Kompressorrad 350g TiAl