THE EFFECT OF FEED SPEED ON THE QUALITY OF TITANIUM-ALUMINIUM BIMETAL FORMED BY FRICTION STIR WELDING
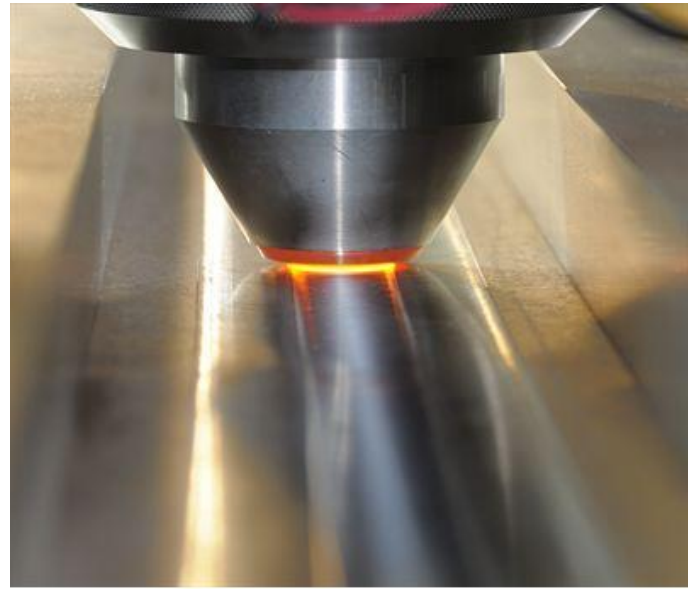
Ermakova Svetlana Aleksandrovna,

Eliseev A.A., Rybtsov V.E.

Institute of Strength Physics and Materials Science
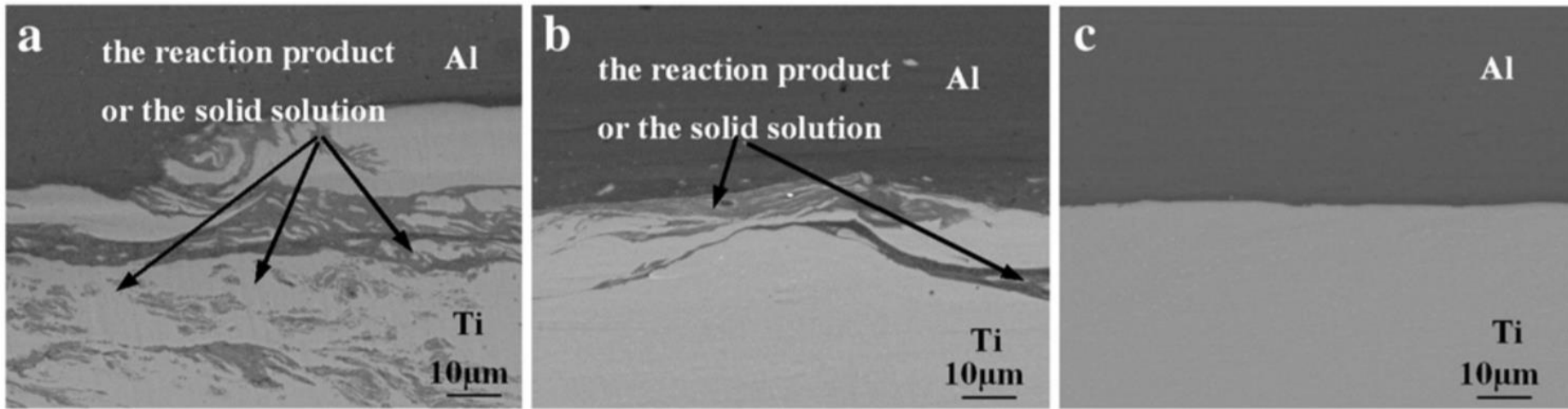*Laboratory for Material and Structural Quality Control*

Plan

- Motivation
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- Materials
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- Friction stir welding tool
- Welding modes
- Bimetal Geometry
- Raster electron microscopy
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Motivation

Intermetallics

deformation, temperature

The aim:
To investigate the characteristics of titanium-aluminum bimetal formation by friction stir welding and the dependence of the interface surface on welding process parameters

Materials

Aluminum alloy **AMg5** - thickness of sheet metal 2.5 mm.
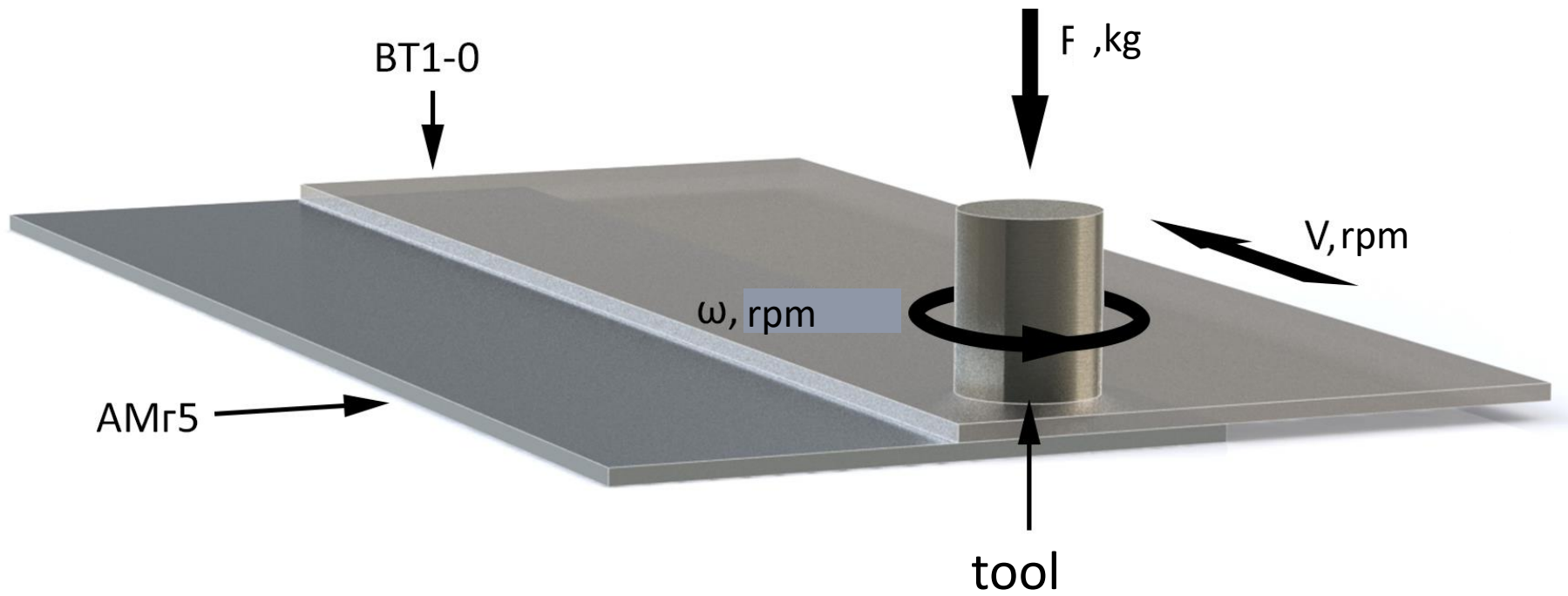
Chemical composition, %:

Fe	Si	Mn	Ti	Al	Cu	Be	Mg	Zn
up to 0,5	up to 0,5	0,5-0,8	0,02-0,1	91,9-94,68	up to 0,1	0,0002-0,005	4,8-5,8	up to 0,2

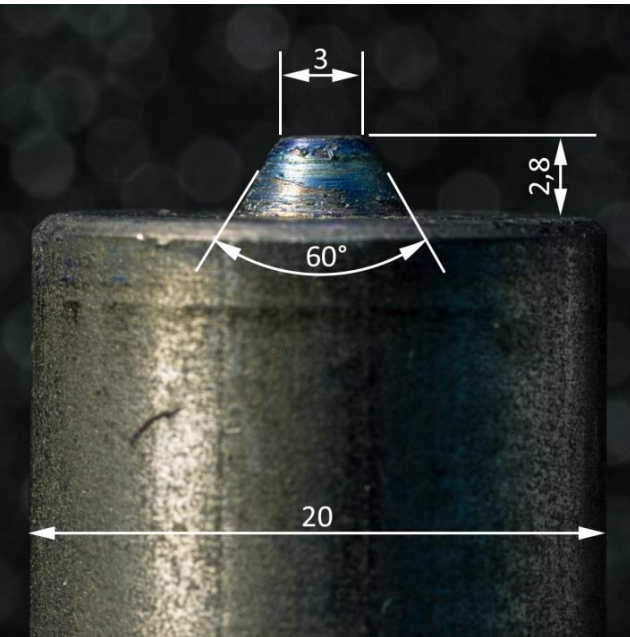Titanium alloy **BT1-0** - thickness of rolled sheets 2.5 mm.

Chemical composition, %:

Fe	C	Si	N	Ti	O	H
up to 0,18	up to 0,07	up to 0,1	up to 0,04	98,61-99,7	up to 0,12	up to 0,01

Welding scheme

BT1-0

F ,kg

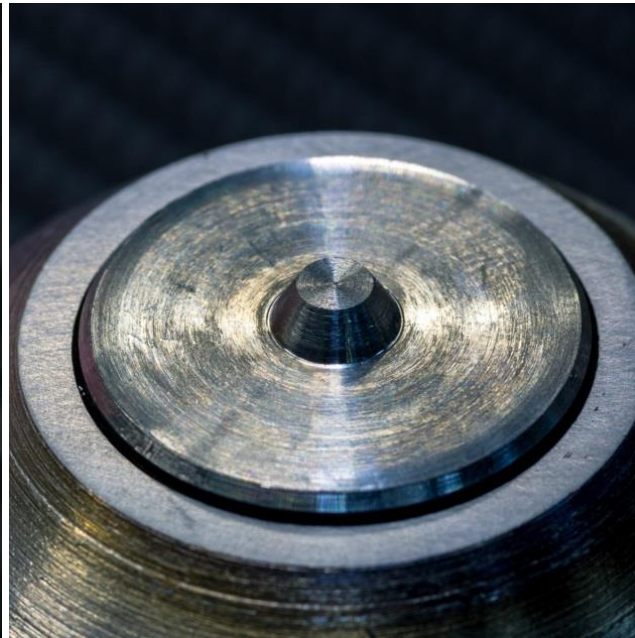V,rpm

ω, rpm

АМг5

tool

Friction stir welding tool

ZhS6U
(Ni-10W-10Co-9Cr-6Al-2Ti-2Mo-1Fe-1Nb)

Before welding

After welding

Welding modes

№	Rotation speed, rpm	Feed rate, mm/min	Load, kg
1	950	180	800
2	950	150	800
3	950	100	800
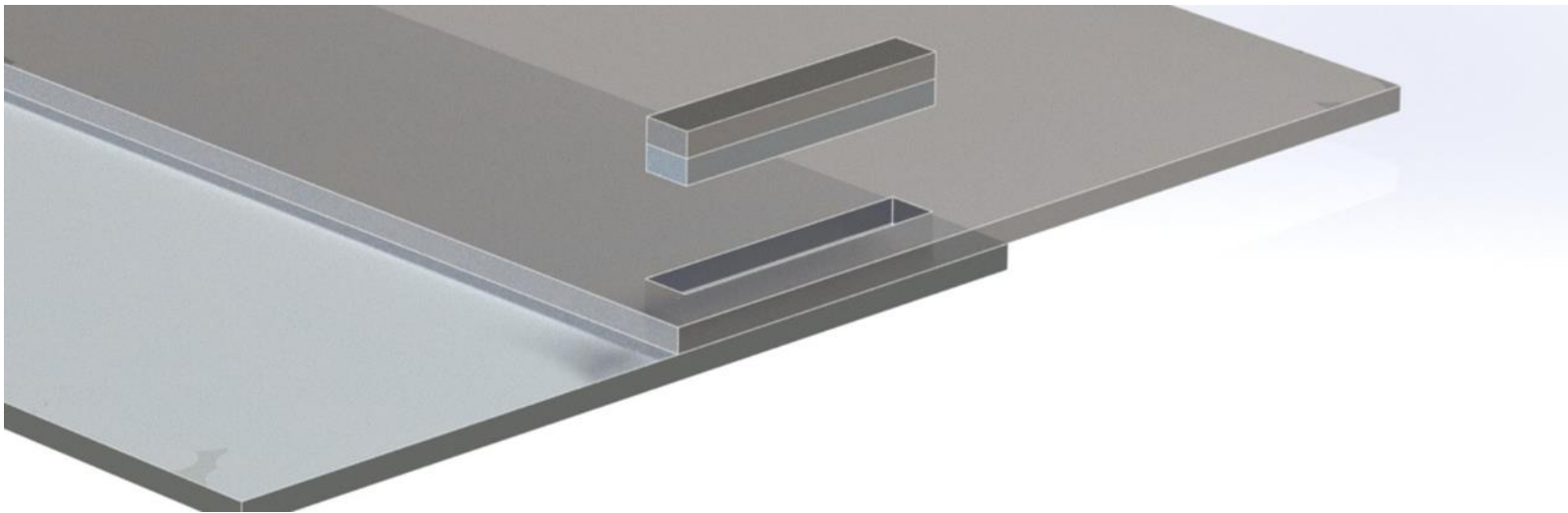
Bimetal Geometry
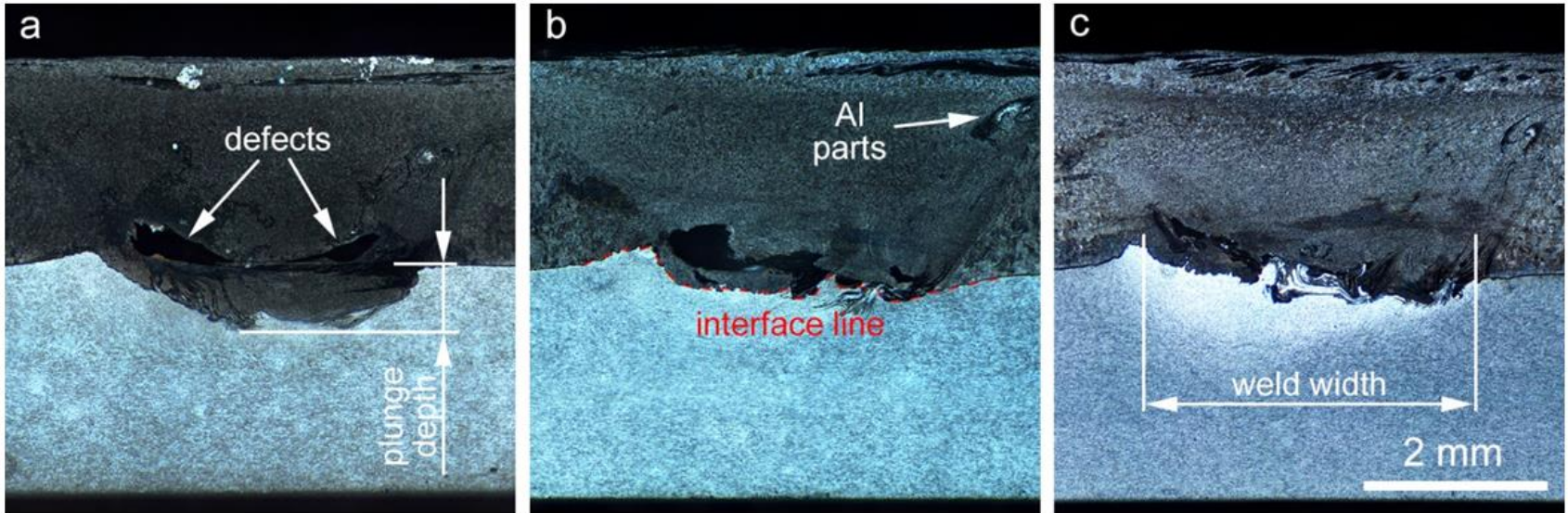
#	Joint width, mm	Plunge depth, mm	The length of the interface, mm	Defect area, mm2
1	3.6±0.1	0.64±0.03	4.7±0.1	0.259±0.005
2	3.6±0.1	0.23±0.05	6.1±0.1	0.210±0.003
3	3.8±0.1	0.28±0.05	6.6±0.1	0.052±0.002

Raster electron microscopy
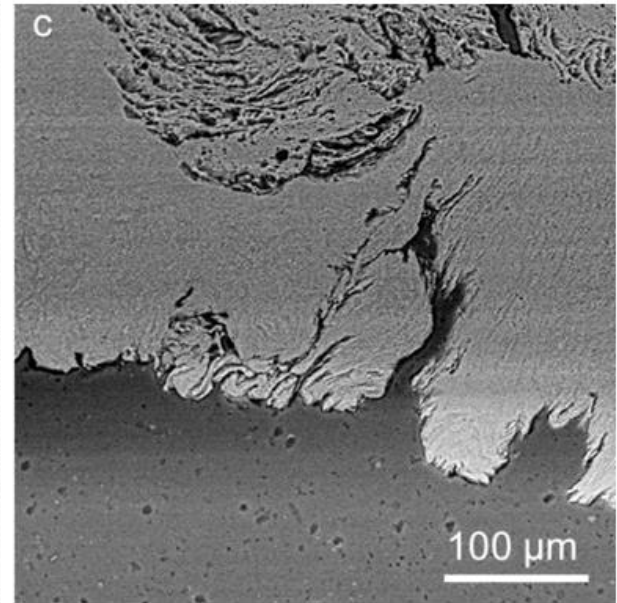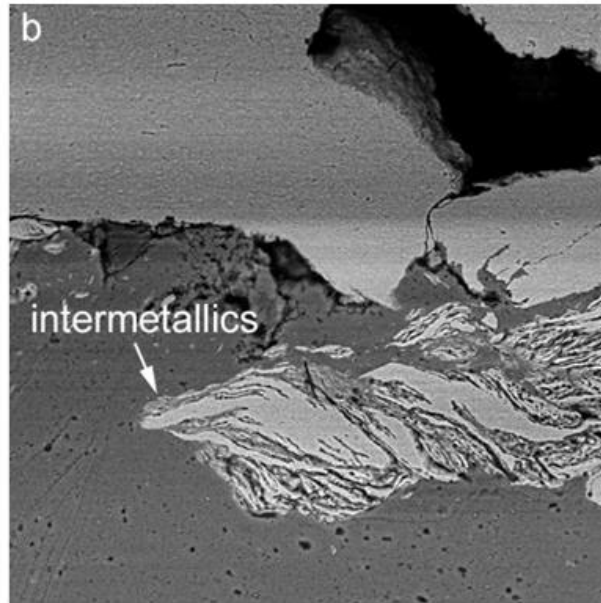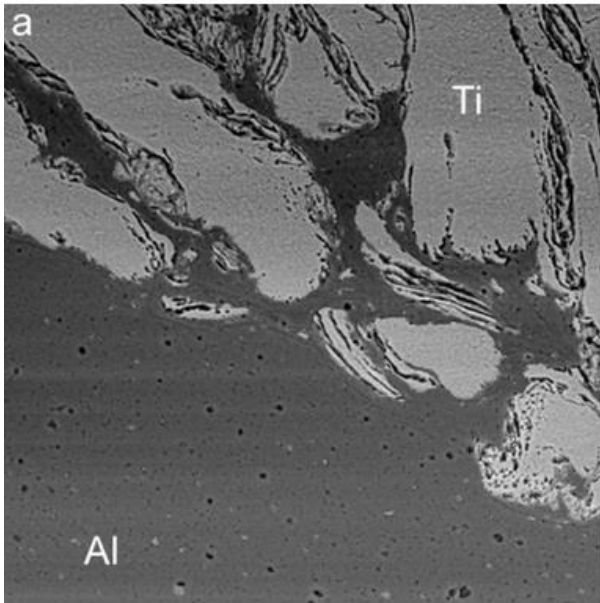
Conclusions

- The Reduced feed rate leads to the intermetallic formation, but the compound is a mechanical mixture.

- The Decrease in feed rate leads to The reduction of macrodefects and the development of the interface surface.

- The strength of a compound is the mostly affected by the development of the interface.

Thank you for your attention