Project report 2020

CONCORD

Corrosion friction stir welDing

MAIN PARTICIPANTS

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OVERVIEW *(keep within this page)*

Starting year: 2020 **Current researchers** (permanent/non-permanent): 2 person-month/year

Positioning *(Multiple selection allowed – total 100%)*

	Transportation	Energy	Eng. for Health
Materials and structure design	50		
Surfaces and interfaces		50	
Simulation and modeling			

Other:

Include partner from ☐ Outside ELyT ☐ Industry

Main funding source(s)
☐ Public project(s) ☐ Industrial ☒ Own resources

IFS CRP/LyC project? ☐ Yes ☒ No

For main projects: Agency / year / name of project *(up to 3, past projects in gray)*

- none

Estimated annual budget: none

Highlights & Outstanding achievements *(3-5 bullet points)*

- not yet

Illustration *(5x5 cm² max)*

PROJECT DESCRIPTION

Background (10 lines max; Calibri 11)

In many commercial applications, welding is inevitable. However, fusion welding processes often results in some problems with hot cracking in fusion zone due to segregation of alloying elements (Inconel alloy as example) or formation of intergranular Cr-rich carbides in the heat affected zone (as for austenite stainless steel). These metallurgical modifications affect the corrosion properties of the materials, consequently. To alleviate these microstructural problems, careful control of the weld metal composition and temperature are often required during welding.

Friction stir welding (FSW) achieved satisfactory products with better mechanical properties and better cost efficiencies than conventional fusion welding techniques. FSW is a solid-state joining process with low heat inputs, leading to the formation of fine grains, low distortion and no macro segregation. For 304 stainless steel, moreover, FSW leads to a relatively low degree of sensitization in the HAZ. Therefore, the corrosion resistance of the fusion weld could be improved with the subsequent friction stir processing (FSP) on the fusion zone of austenitic stainless steels.

Key scientific question (2 lines max; Calibri 11)

How stir welding affects the local electrochemical behavior of stirred zone?

Research method (8 lines max; Calibri 11)

To better understand improvement of the corrosion resistance of the join zone and its surrounding in the fusion zone by FSP, local electrochemical analysis will be carried out to correlate the metallurgical state of the material, the passive film properties and the pitting sensitivity of the surface. These characterizations will help to optimize next FSW join to better resist to aggressive environments, and to expand use of FSP as the surface modification method to improve performance of austenitic stainless steel weld.

Research students involved *(gray color for previous years)*

Ph.D. candidates (years, institution):

Master/Bachelor students (years):

- Mr. Naru Kawauchi

Visits and stays *(gray color for previous years)*

FR to JP (date, duration):

JP to FR (date, duration):

COMMUNICATIONS AND VALORIZATION

Journal publications *(gray color for previous years)*

	Authors	Title	Journal	Vol.	pp. / ID	Year	DOI
1							
2							

Conferences *(gray color for previous years)*

	Authors	Title	Conference	Date	City	Country	DOI *(if applicable)*

Patents *(gray color for previous years)*

	Inventors	Title	PCT #	Year
1				
2				

Others *(gray color for previous years)*

	People	Event	Description	Date
1				
2				