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F82H−316L間及び316L−316L間の溶接部におけるシャルピー衝撃特性
Charpy Impact Properties of F82H/316L and 316L/316L Welded Steels

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1. Introduction and background

International Fusion Materials Irradiation Facility/Engineering Validation and Engineering Design Activities (IFMIF/EVEDA) are in progress, a periodic replacement is necessary for the Target Assembly (TA) because the materials at back-plate of TA are severely damaged by neutron irradiation. The remotely-handled welding is required to connect the renewed TA into the lithium loop for the maintenance.

In this study, an engineering validation test and engineering design evaluation on the lip-seal welding technique which includes the weldability of dissimilar metals has been reported.

2. Experimental

The test method of Charpy impact test was compliant with JIS Z 3128 “Method of Impact test for Welded Joint”. The Charpy specimen was fabricated from both material; the welded joint by two of the type 316L steels (Specimen ID. 12-9) and the welded joint by type 316L steel and F82H steel (Specimen ID. F82). The Specimen ID. F82 is regarded as a dissimilar metal joint. The specimens for Charpy impact test are shown in Fig.1.

3. Results and Discussion

The results of Charpy impact test is shown in Table 1. The impact values 128 J/cm^2 and 81 J/cm^2 were measured in the 316L/316L joint and dissimilar metal joint, respectively.

The obtained impact data in this study was compared to data which had been reported in the paper [1] by Hara et.al. including such as Charpy impact data of base metal, SUS316L because there was no test data with base metal. However, it is difficult to compare directly to the reported data because its data obtained by using the specimen welded an Electron Beam (EB) butt-welding not TIG welding. But, the comparing the reported data between welded region and base metal is useful as a reference in order to assess the obtained impact data.

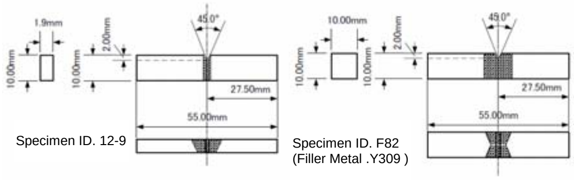

Fig.1 The specimens for Charpy impact test

The impact value (128 J/cm^2) at the 316L/316L joint in this study is about 79% of the reported value (163 J/cm^2) which is measured at the base metal of type 316L steel. The impact value(120 J/cm^2) measured at the base metal of F82H steel and the impact value(76 J/cm^2) measured at the dissimilar weld joint of F82H steel and type 316L steel have been also reported in the paper, as well. The dissimilar weld joint of F82H steel and type 316L steel shows about 36% lower impact value than that of the base metal of F82H steel. Therefore, an impact value measured at welded region would be lower than that of base metal region.

The impact value obtained at the 316L/316L joint in this study looks reasonable data considering the comparison with a reference data even though some differences exist such as welding method and types of joint. On the other hand, the impact value obtained at the dissimilar weld joint of F82H steel and type 316L steel in this study is almost same to the value reported in the paper. Although the number of test in this study, that is N=1, the obtained data would be reasonable considering the comparison with a reference data. But, it is necessary increasing the number of test in order to improve the quality of measured data.

4. Summary

It is found that the obtained data in this study would be reasonable considering the comparison with a reference data. But, it is necessary increasing the number of test in order to improve the quality of measured data.

Acknowledgments

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References

[1] N. Hara, Fusion Science and Technology, Vol. 56 (2009), pp. 318-322.

Table 1 The results of Charpy impact test

Specimen ID.	Weldment	Temperature [°C]	Specimen shape [mm]			Absorbed energy [J]	Impact value [J/cm^2]	Percent of ductile fracture [%]
			Thickness	Width	Length			
F82	316L/82H	RT	7.97	9.97	54.99	64	80.54	30
12-9	316L/316L	RT	7.98	1.71	54.82	17.5	128.24	20