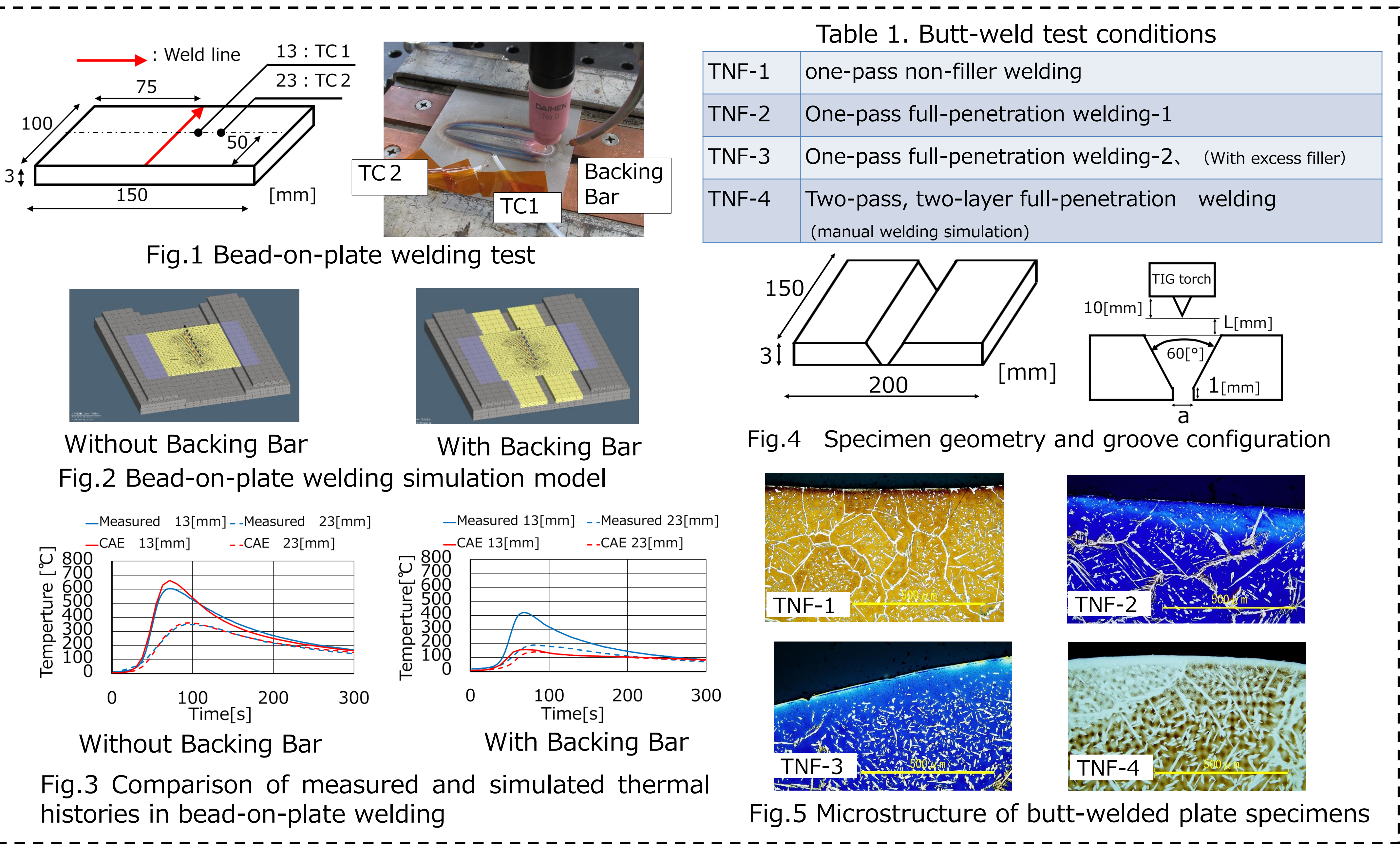
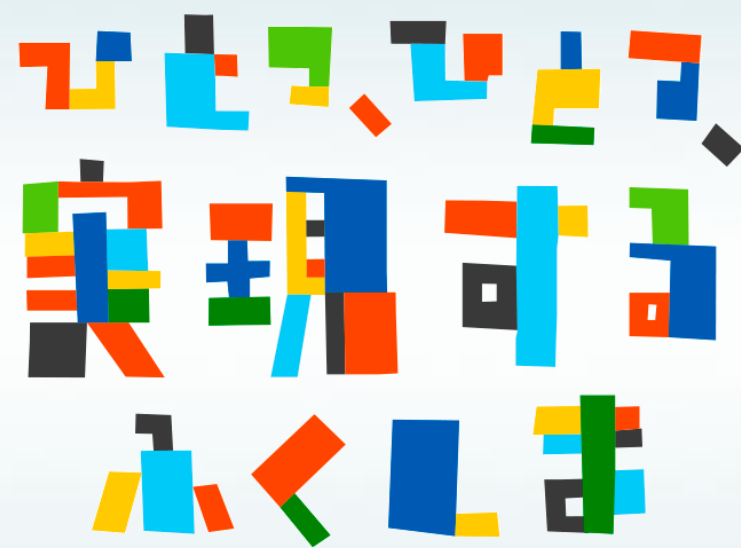




Background・Purpose

Duplex stainless steel has attracted attention as a highly corrosion-resistant material suitable for hydrogen and ammonia environments. However, inappropriate welding conditions can significantly degrade its corrosion resistance. To address this issue, welding experiments and evaluations are conducted under multiple conditions with the aim of establishing reliable welding procedures and assessment techniques. In addition, this study seeks to predict thermal histories that yield sound microstructures through numerical simulation.

Research Contents

Bead-on-plate (BOP) welding tests were conducted on 3-mm-thick plates with and without a Backing Bar, and the results were compared with simulated and thermocouple-measured thermal histories.

Butt-welding tests were also performed under full-penetration conditions while varying the heat input, wire feed amount, and number of passes, followed by ferrite content measurements and microstructural observations.

Summary

For the thermal-history prediction, the maximum difference in peak temperature between the simulation and the thermocouple measurements was 58 °C under the no-Backing-Bar condition, and the cooling curves showed good agreement.

In the butt-welding tests, the ferrite content of the base metal was 50–53%, whereas non-filler welding resulted in approximately 80%. However, the ferrite content improved to 53% with a two-pass weld.