Micro Structure and Hardness Analysis of Brass Metal Welded

Lukman Faris N[1], Muljadi[1], Djuhana[2]

[1]*Research Center for Physics - LIPI*
Kawasan Puspiptek, Serpong, Tangerang Selatan 15314, Indonesia
[2]*Mechanical Engineering Department – UNPAM*
Tangerang Selatan 15314, Indonesia

Email: lukm008@lipi.go.id

Abstract. Brass metals are widely used for plumbing fittings. High tensile brasses are more highly alloyed and find uses in marine engineering. The welding of brass metal has been done by using electrical weld machine (SMAW). The microstructure of brass metal welded was observed by optical microscope. The result can see that the microstructure has been changed due to heat from welding. The microstructure of original brass metal is seen a fine laminar stucture, but the microstructure at HAZ appears bigger grains and some area at HAZ is seen coarser microstructure. The microstructure at weld zone can be seen that it was found some of agglomeration of materials from reaction between brass metal and electrode coating wire. According the hardness measurement, it is found highest hardness value about 301.92 HV at weld zone, and hardness value at base metal is 177.84 HV

1. Introduction

Brass is sample of copper zinc alloy, it easy to cast, with excellent machinable and good resistance to corrosion in air and fresh water. They are widely used for plumbing fittings. High tensile brasses are more highly alloyed and find uses in marine engineering [1]. Welding is a process in which materials of the same basic type or class are joined together trough the formation of primary (and occasionally and secondary) atomic or molecular level bonds under the combined action of heat and pressure [2]

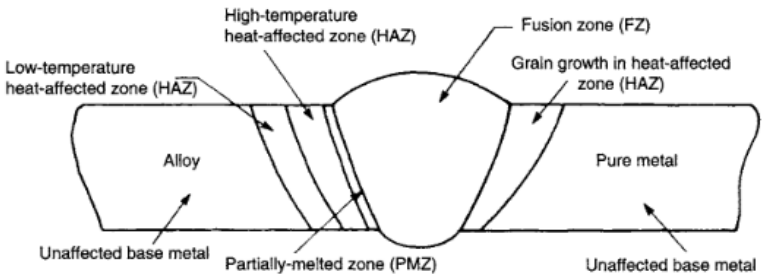

Figure 1. The American Welding Society Classification of Welding and Allied Processes [3]

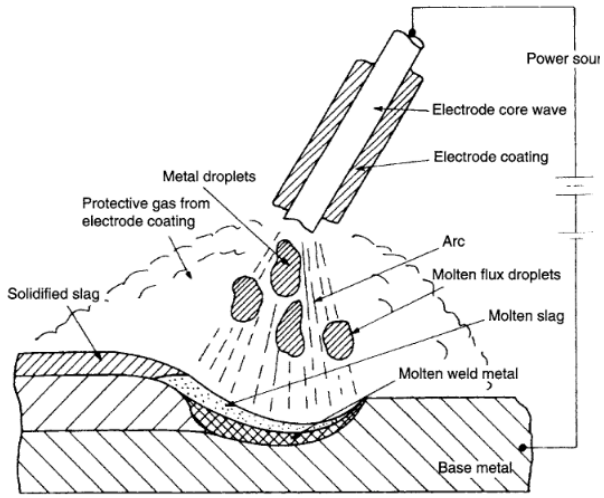

Figure 2. Schematic Ilustration of the shielded metal arc welding (SMAW) process [3, 4].

SMAW can operate with DC power sources (with electrode positive and negative) or AC power sources, depending of coating design. Typically current range from 50- 300 Amperes, largely based on electrode core wire diameter, at 10-30 volts. Resulting in 1-10 kg (2-20 lb) per hour deposition rate.[3, 4].

2. Experimental Method

The welded samples have bean prepared by using brass metal and welding process was use SMAW machine. The flow diagrams of research can be seen at figure 3.

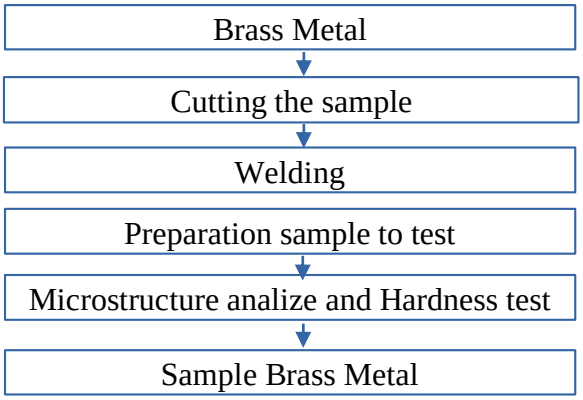

Figure 3. Schematic Diagram for sample test

The characterization of welded samples ware done include: micro structure analysis by using optical microscope and Vickers hardness by using micro hardness tester. There are three zones for micro structure and hardness measurement, such as : base metal, HAZ, and weld zone.

3. Result and Discussion

The result of measurement of hardness vickers can be seen at table 1. The hardness value is different each zone, where base metal has hardness about 177.84 HV, HAZ has hardness about 131.41 HV and welding zone has hardness about 301.92 HV. The hardness at welding zone is highest due to heat effected from welding.

Table 1. Hardness Vickers value of Brass Welding.

Welding Zone	Weld	HAZ	Base Metal
HV	301.92	131.41	177.84

The result of measurement of micro structure can be seen at figure 4-6, the observation was done by using optical microscope with magnification 40x.

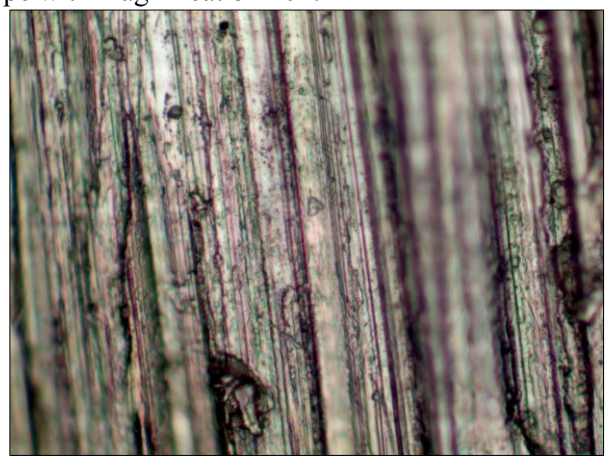

Figure 4. Base metal of brass with 40x magnification.

The micro structure of base metal of brass is seen that fine laminar grains are found according the literature that brass metal has generally a laminar grains [3].

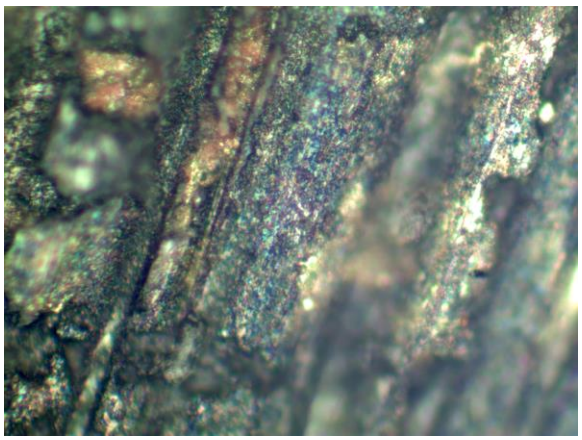

Figure 5. Heat affected zone of brass

The micro structure at HAZ for Brass metal has been changed it is due to heating from welding effect as seen at figure 5. It was found some bigger grains than grains at base metal brass. The grains growth effect at HAZ can decrease hardness value. According the reference that effect of welding can trend decrease hardness from base metal to HAZ [3].

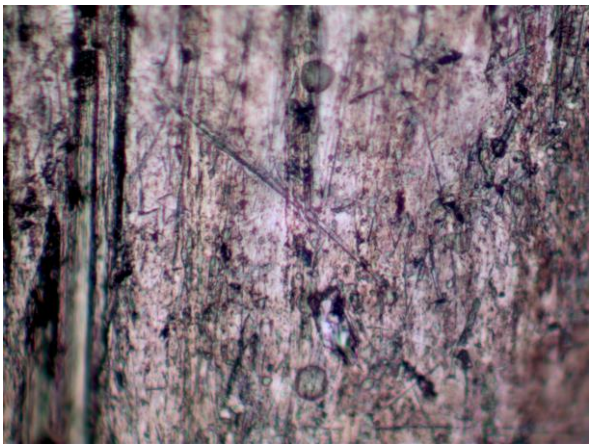

Figure 6. Welding zone of brass

The micro structure at welding zone for brass metal has been changed it is due to heating and melting from welding effect as seen at figure 6. It was found some bigger grains than grains HAZ brass. The grains growth effect at welding zone can increase hardness value. According the measurement of micro structure shows that the hardness value is enough high about twice compare that hardness value at base metal. It indicates that the material at weld zone becomes brittle, that is not good for welding result[5]

4. Conclusion

The joining technique of brass metal by using welding machine has been done, the result is indicated that hardness value and microstructure has been changed significantly due to heat from welding effect. The joing brass metal by using welding can causes the material at weld zone become brittle, properly it is not used joining of brass by using welding.

5. Acknowledgment

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