

STAINLESS

Q&A

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Q: What happens to the root surface of a stainless steel pipe gas tungsten arc (GTA) weld when no backing gas is used? Welders commonly call it “sugaring,” and I have also heard it referred to as “carbide precipitation” (for example, in the June 2007 *Welding Journal*, page 59). If it is carbide precipitation, what is the source of the carbon?

A: The phenomenon of “sugaring” has nothing to do with carbide precipitation, and carbide precipitation has nothing to do with sugaring. I have no idea how this confusion in terms got started, but it is nonsense. I plan to discuss carbide precipitation in a future column.

Sugaring occurs when the root side of a stainless steel weld is exposed to air while it is solidifying. The air severely oxidizes the root side surface. The heavy oxide produces a shriveled surface appearance, which is the origin of the term “sugaring.” Figure 1 shows the root surfaces of two GTA welds in 1½-in. (44-mm) OD by 0.075-in. (1.9-mm) wall thickness 321 stainless tubing. The weld on the left was made with argon backing (purging) gas, while the weld on the right was made with no backing gas. After welding, each tube was cut beside the weld to allow the root surface to be seen. The sugaring is

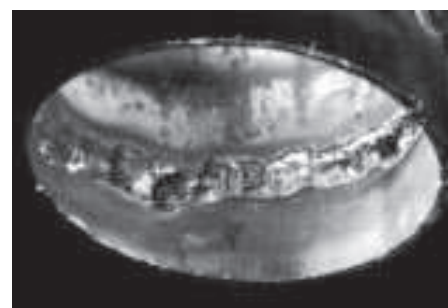
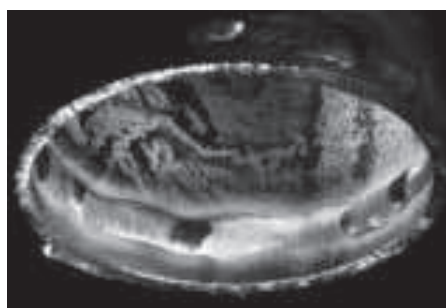


Fig. 1 — Root surface appearance of 321 stainless manual GTA welds made with backing gas (left), and without backing gas (right).

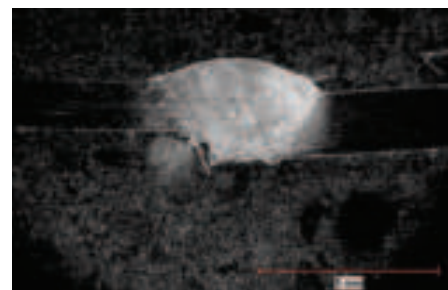


Fig. 2 — Cross sections of manual GTA welds made with backing gas (left), and without backing gas (right).

evident on the surface of the weld on the right, made without backing gas.

A cross section was taken of each of these welds. Each was prepared for macro and micro metallographic examinations.

Figure 2 shows the cross sections. A smooth root contour is readily visible for the weld made with backing gas, but the root contour of the weld made without backing gas is rough and irregular.