1598 CD
DOI: 10.1017/S1431927606069893
Microsc Microanal 12(Supp 2), 2006

Forty-Three Years in Metallography: Changes and Challenges

Arlan O. Benscoter

Lehigh University, Materials Science and Engineering Department, Bethlehem, PA 18015

Every year has brought new metallographic challenges to the metallographer. New devices are being manufactured, such as the medical stent, and new materials such as galvalume coating on a steel substrate are scrutinized under the microscope. The vendors of metallographic supplies and equipment have helped us keep abreast of these many challenges by the constant improvement of grinding papers, fixed diamond plates, mounting materials, polishing compounds, polishing cloths, and metallographic equipment. Without the vender's interest and financial investments in improving their line of metallographic consumables and equipment, the challenges that metallographers face today would be overwhelming.

This talk will review the personal challenges over the last forty-three years of developing Continuous Cooling Diagrams using the Jominy bar end quench technique and it's advantage over the dilatometry procedure, the development of tint-etching techniques [1]; investigating the cause of microcracking in plate martensite by serial sectioning [2] (see Figure 1); hot-stage microscopy showing the phase transformation of austenite to pearlite, austenite to bainite, and austenite to martensite [3]; and, measuring the dendrite arm spacing of a aluminum-zinc-silicon (Galvalume) 20-µm thick coating on quarter-inch steel wire (see Figure 2). Also covered will be experiences encountered performing field metallography in hostile environments; the development of a metallographic technique to metallographically prepare and electrolytically etch a shape memory stent that did not expand to its intended shape and size when placed in an artery.

[1] A.O. Benscoter et al., *An Etching Technique for Fe-Ni Massive Martensite*, Practical Metallography (1968) pp 694-700

[2] A. R. Marder et al., *Microcracking Sensitivity in Fe-C Plate Martensite,* Metallurgical Transactions Volume 1, June 1970 pp1545-1549

[3] B. L. Bramfitt et al., *The Use of Hot-Stage Microscopy in the Study of Phase Transformations,* ASTM Special Publication Public 557, pp 43-70

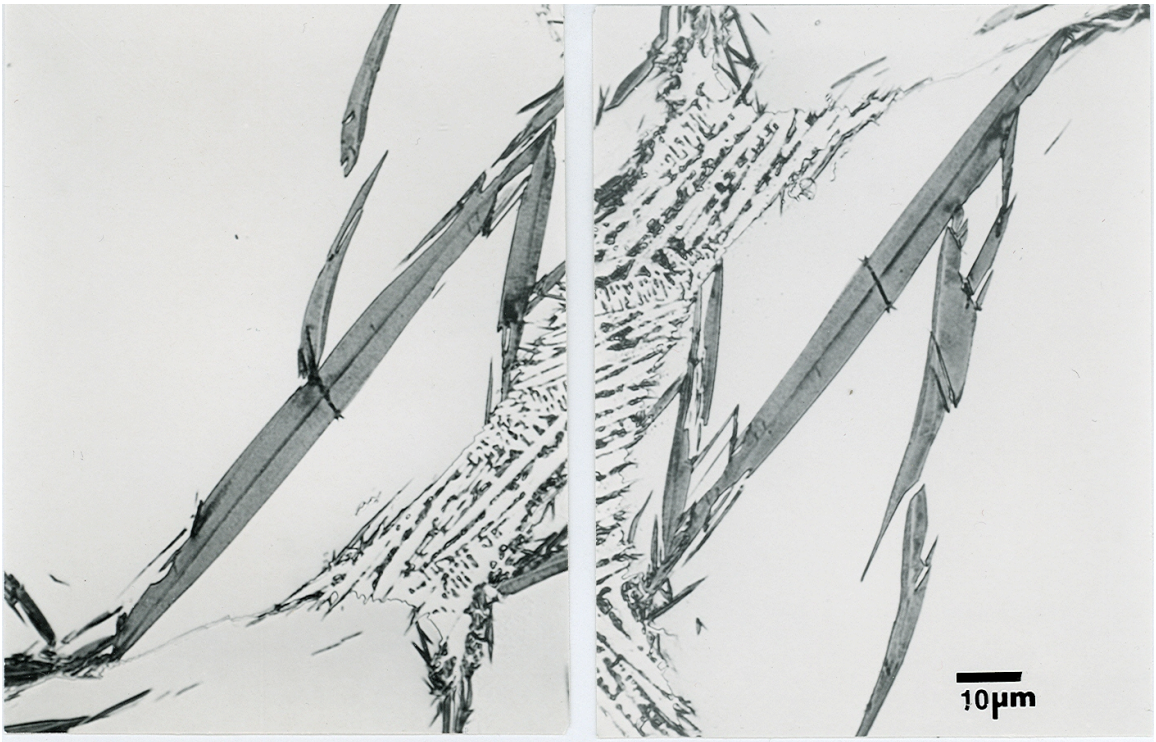

Figure 1a ,1b. Two photomicrographs out of a series of 50 serial planes showing that microcracking in plate martensite is caused by impingement of the plates. 1a, section #11, 1b, section #12. Etched in 2% Nital 1000X

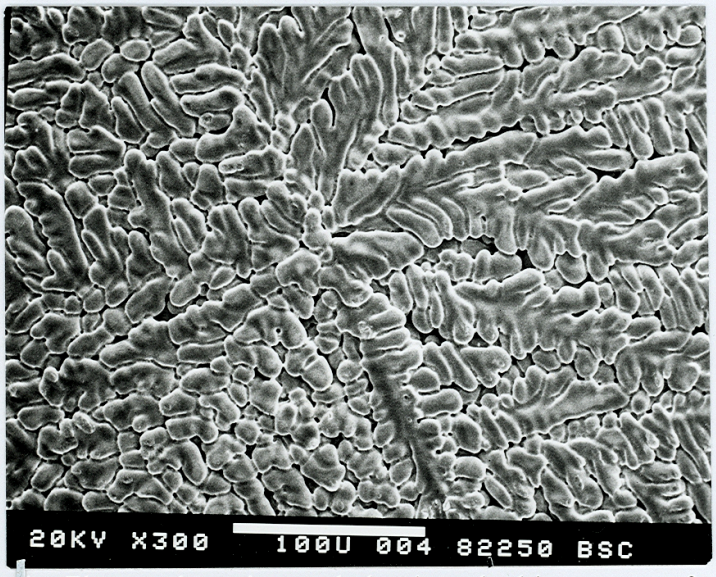

Figure 2. Scanning Electron photomicrograph showing a dendrite structure of an aluminum-zinc-silicon coating a steel wire. Structure was revealed by suspending the as coated wire over fuming nitric acid for 10 minutes.

https://doi.org/10.1017/S1431927606069893 Published online by Cambridge University Press