

Model 1060 SEM Mill

Preparing cross sections of materials with very different mechanical properties

Results of a bulk galvanized steel cross-section sample prepared by broad-beam ion milling for scanning electron microscopy (SEM).

Mechanical preparation

A bulk sample of galvanized steel (10 x 10 x 1.5 mm) was cut and polished mechanically; diamond lapping films were used to produce a 1 µm final polish. The sample was observed under SEM at 1 kV, SED (ET), 3000x magnification (Figure 1, top image).

Ion beam preparation

The cross-section sample was prepared by broad-beam ion milling using the Fischione Instruments Model 1060 SEM Mill.

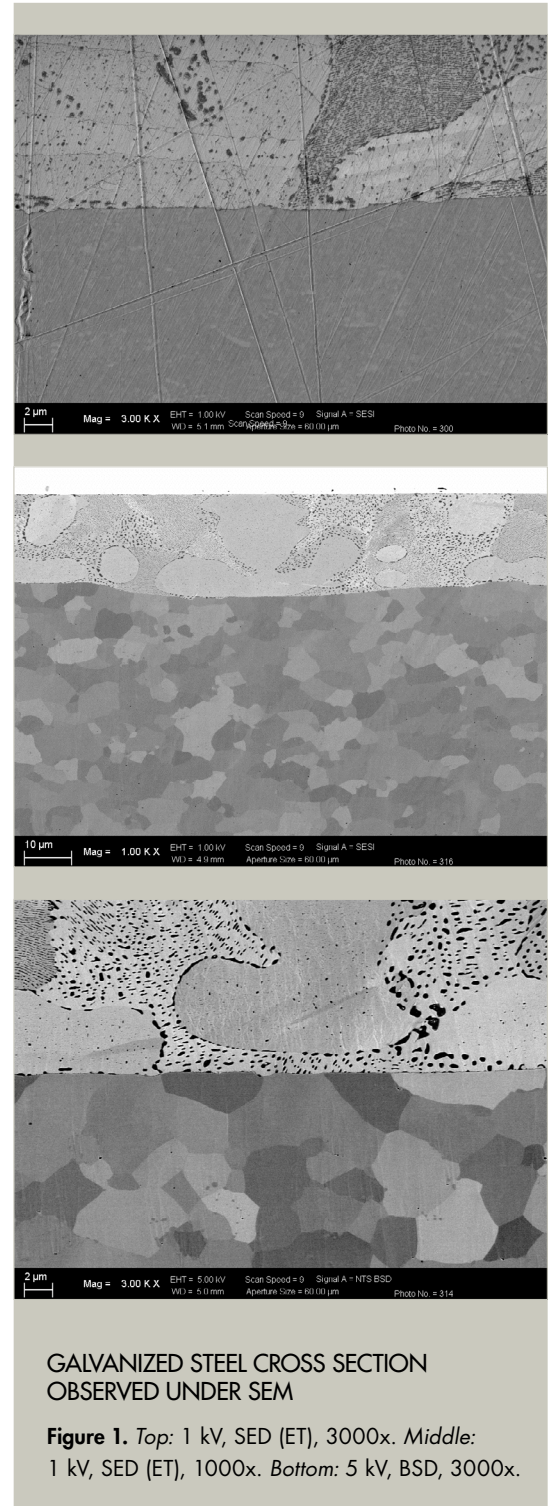
The ion milling parameters used were:

Parameter	Setting
Voltage	5 kV
Beam angle	7°
Stage rotation	Rocking
Milling time	40 minutes

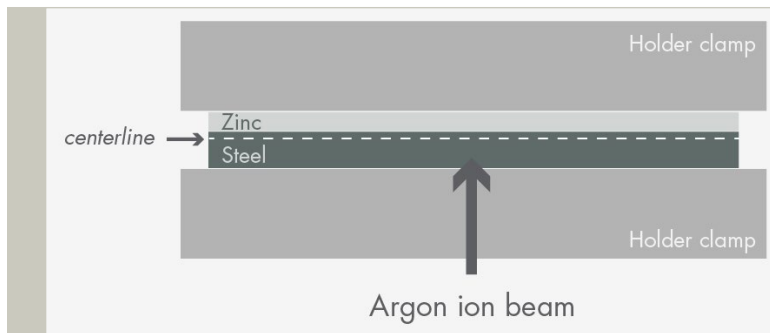
Results and analysis

The cross section was observed under SEM at 1 kV, SED (ET), 1000x magnification (Figure 1, middle image) and 5 kV, BSD, 3000x magnification (Figure 1, bottom image).

The ion source was directed at the steel side of the cross section (see Figure 2). Using an optimal combination of low incident beam and rocking angles, the surface is planarized. This generates electron channeling contrast, which allows the grain structure to be revealed. Microstructural features in both the zinc and steel are highlighted while preserving the interface separating the two materials. Generating such a result is often challenging, because the zinc and steel surrounding the interface sputter at very different rates.



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MANAGING DIFFERING SPUTTER RATES

Figure 2. The ion source is directed at the steel side of the cross section. Milling at a low angle from the direction of the material with a lower sputter rate (steel), as well as offsetting the sample from the centerline of the holder, minimizes sputter from the material with the higher sputter rate (zinc).



MODEL 1060 SEM MILL

Figure 3. Premium Edition shown.



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Document Number AN010 Revision 00 03/2014