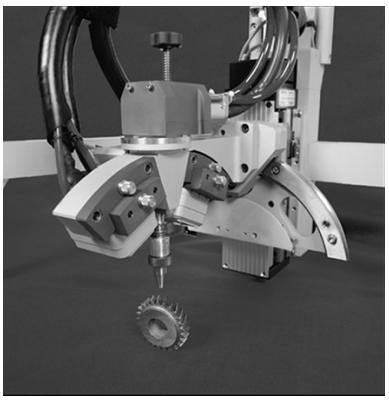
Superior Stress Measurements on Aluminum and Its Alloys



The TEC 4000 X-Ray Diffraction System

X-ray residual stress measurements made with Cu Kα radiation at high back reflection angles on aluminum produce more precise data than measurements made with Cr Kα radiation at lower back reflection angles. {511/333} planes for aluminum produce a reflection at ~162° 2Θ using Cu Kα radiation. While many other diffractometers are limited to back reflection angles no greater than 157° 2Θ, the TEC diffractometer with its position sensitive proportional counter is capable of reaching the high back reflection angle needed for aluminum planes.

There are many reasons why {511/333} aluminum planes give better results. First, higher back reflection angles result in a larger peak shift for a given strain. Thus, the stress measurement is generally more precise when a higher back reflection angle is used. Secondly, the {hhh} type planes (i.e., {333}) are less sensitive to preferred orientation effects due to elastic anisotrophy. Often aluminum or aluminum alloys exhibit preferred orientation that result in nonlinear dspacing versus $\sin^2\psi$ plot. Measurements made on {hhh} type planes often result in a linear d-spacing versus $\sin^2\psi$ plot. Linear data is preferable because it translates to more precise results.

Finally, aluminum and aluminum alloys often have relatively large grains as a result of processing. Cu Kα radiation penetrates more deeply into aluminum than Cr Kα radiation (at a ratio of 3.3:1). The deeper penetration means that the undesired effects of large grain size on x-ray diffraction data are minimized.

By easily providing superior measurements on aluminum and its alloys, the TEC 4000 X-Ray Diffraction System gives the quality results your company needs.

TEC's Materials Testing Laboratory Services are

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