**HY-Tech Research Corporation, "Fabrication of Ribbon Loads for Soft X-ray Sources", *R.C. Hazelton, C.C. Klepper, J.J. Moschella, and E.J. Yadlowsky, F. Barakat, J. Niemel*, HTML No. 97-057**

HY-Tech Research Corporation has a program in the area of plasma radiation sources (PRS). The most common PRS is the *z-pinch* where wire arrays are imploded (by means of mega-amp scale current pulses) to produce high density (>$10^{19}$ $cm^{-3}$), hot plasmas. These become intense x-ray sources for high energy density physics experiments.[1] The objective of this program was to replace the wires in the loads with thin ribbons (≤1μm), whose composition can be varied over a larger range than can be achieved with alloy wires. The thin ribbons are expected to vaporize more quickly than the (10μm or larger) wires, thereby reducing precursor plasma formation, which can soften the implosion. The mixed composition should increase the x-ray yield by reducing the optical opacity of the source.

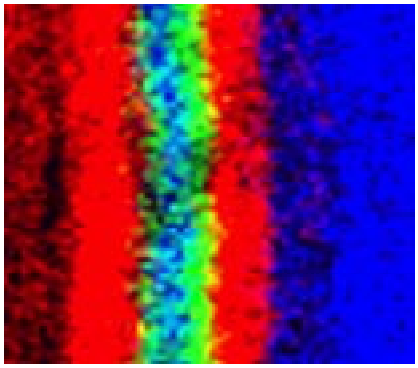

**Figure 1. Composite image showing all the layers in the ribbon (Al:red, Mg:green, Si:blue).**

The ribbons, which were composed primarily of aluminum, with layers of such elements as Si and Mg, either mixed in or layer onto the Al, were fabricated at HY-Tech using a combined thermal and electron beam evaporator. In one design, Mg and Si were added to the Al in a layered structure. To analyze this structure, a unique electron probe setup was used at the HTML facility, to simultaneously study the composition and the microstructure of the 1μx1mm cross-section ribbon. Figure 1 shows a composite image showing the Al-Mg-Si-Al layered structure. The silicon on the bottom part of the image is from the Si substrate, which was used for this test sample. To image the individual layers on length scales present required a drastic reduction in the probe's sampling area all while keeping the probe energy sufficiently high to produce the detailed data the HTML facility was able to extract.

[1] M.Keith Matzen, Phys. Plasmas 4 (5), May 1997

Some of the ribbons made in the same batch as the test sample, which was analyzed at HTML, were loaded on the Double-Eagle pulsed power accelerator in San Leandro, CA. A typical soft x-ray spectrum obtained with a survey spectrometer is shown in Fig. 2. Spectral features corresponding to all three elements present in the ribbon are seen in this spectrum. Analysis is under way to determine the radiation efficiency of the system and its components.

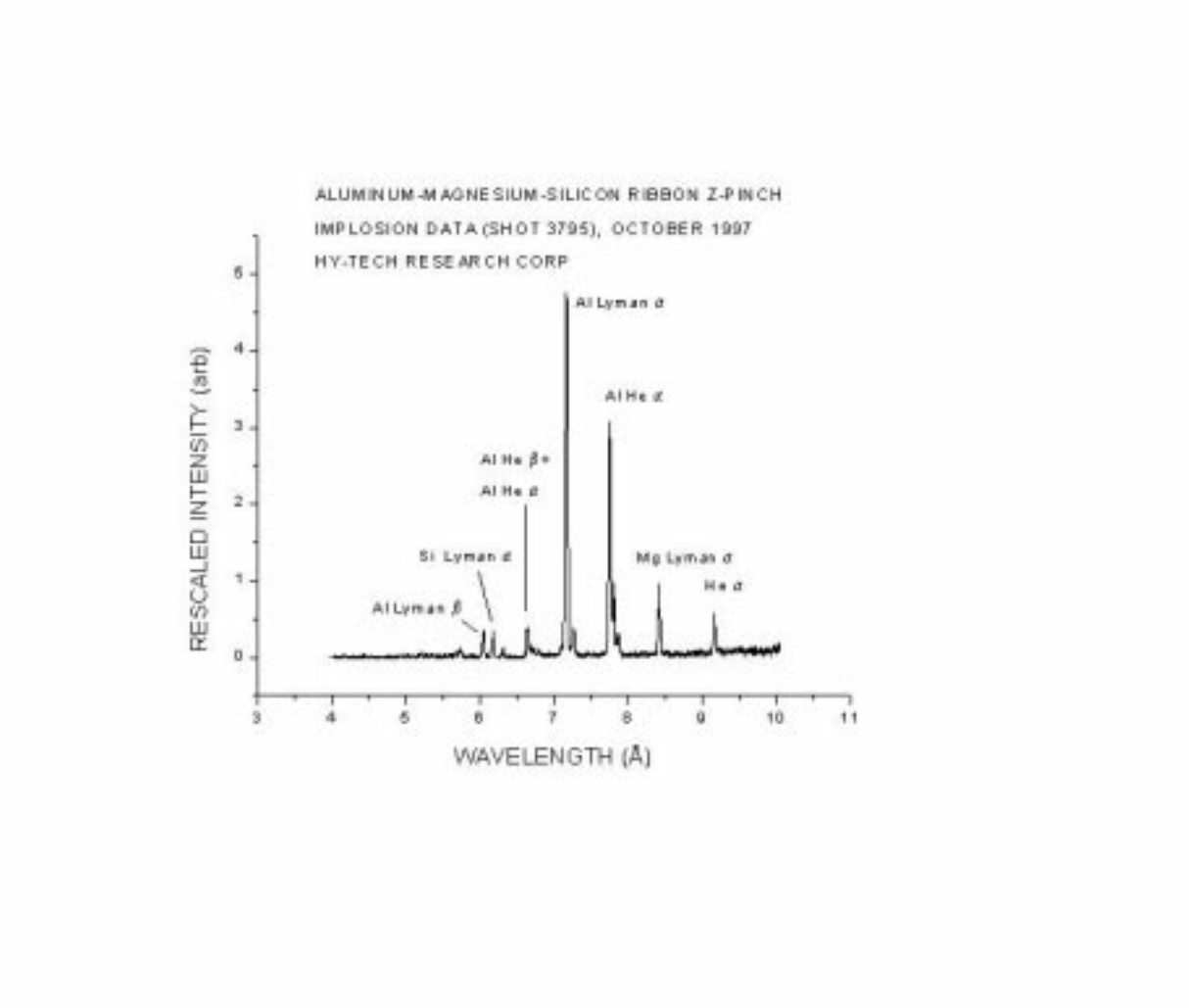


Figure 2. X-ray spectra from the implosion of composite layered ribbons.