RTI PAST PERFORMANCE	
RTI Tracking Number:	1203084 Date:3/9/2012
Core Task:	Metallurgical Testing, Chemical Analysis, Plating and Coating Analysis
Analytical Techniques	FTIR/SEM/EDS

Two parts were received for analysis and were identified as follows:

1 – Unlabelled
2 – NG

The target of the analysis was to characterize apparent areas of rubber splitting by examination and comparison of the split faces and bulk using techniques of Scanning Electron Microscopy (SEM), EDS (Energy Dispersive X-ray Spectroscopy) for qualitative identification of elements with atomic number greater than five, and FTIR (Fourier Transform Infrared Spectroscopy) for identification of organic functional groups. The results of the analysis are discussed below.

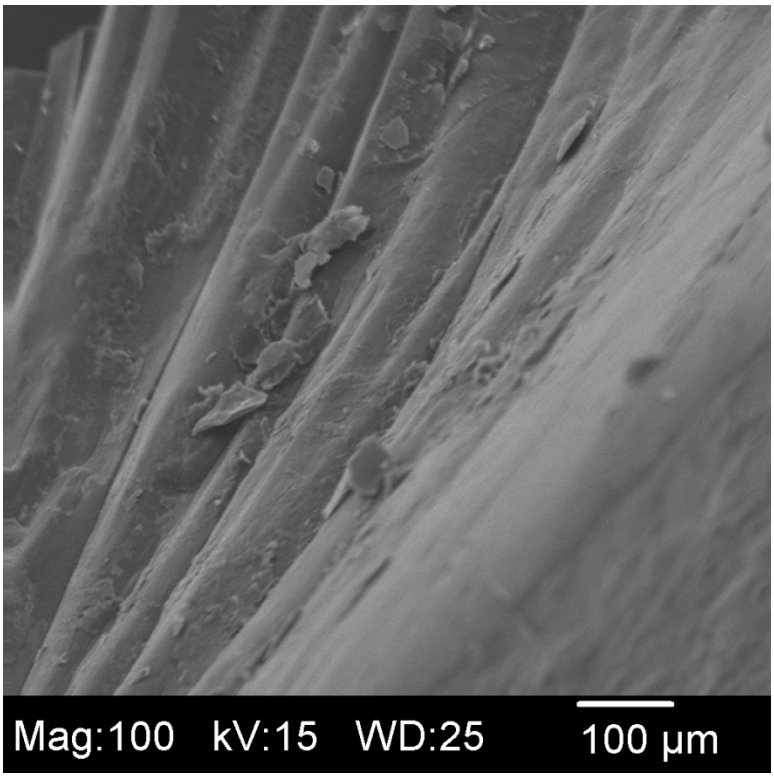

Figure 1a – SEM photomicrograph obtained from the sample 1 split face at 100X magnification

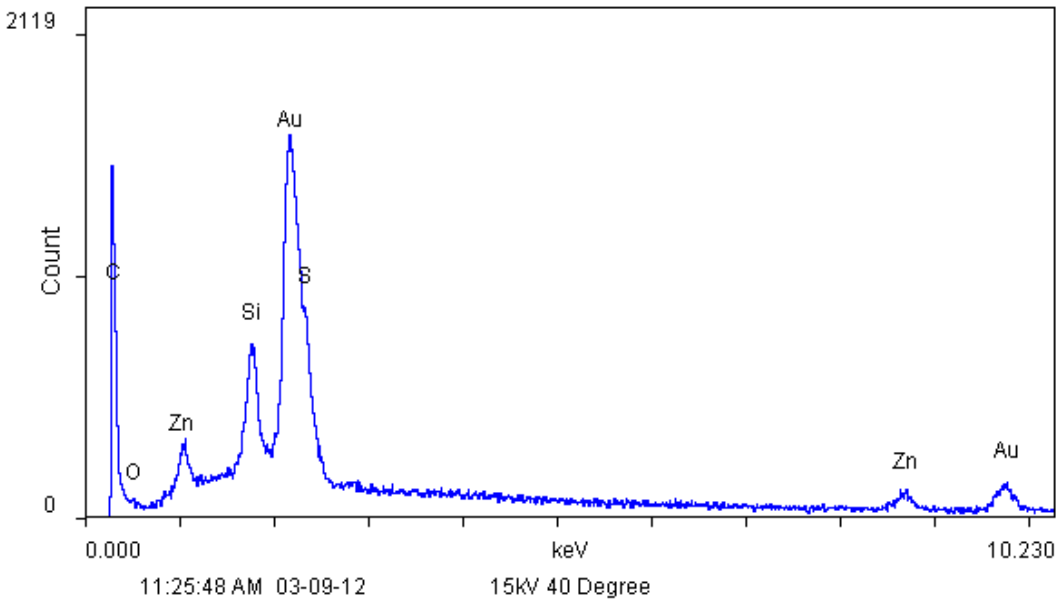

Figure 1b – EDS spectrum obtained from the sample 1 split face – Major elements (>10%) – carbon; Moderate elements (2-10%) – zinc, sulfur, silicon, oxygen; Minor elements (0.2-2%) – none

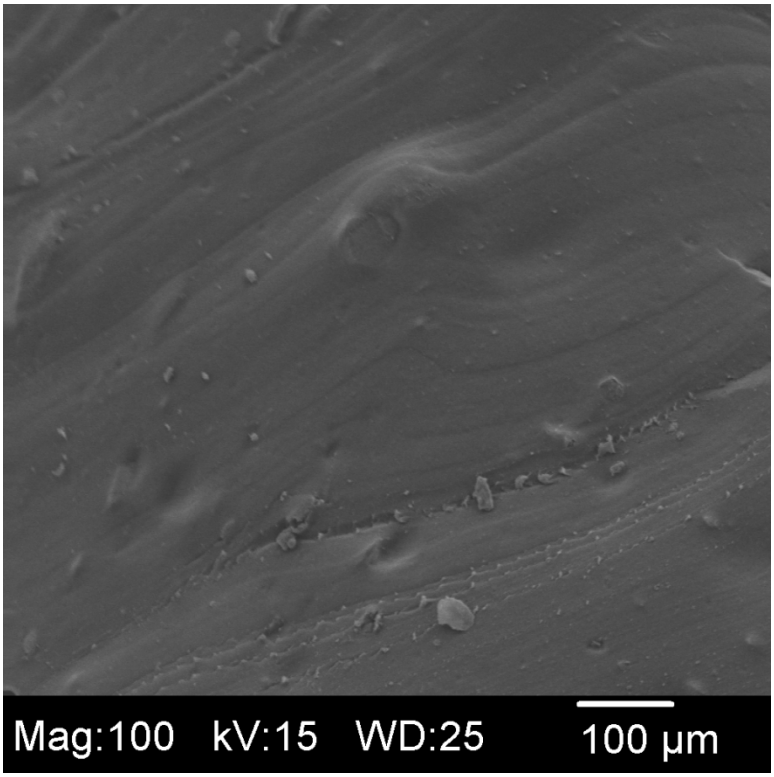

Figure 1c – SEM photomicrograph obtained from the sample 1 bulk rubber at 100X magnification

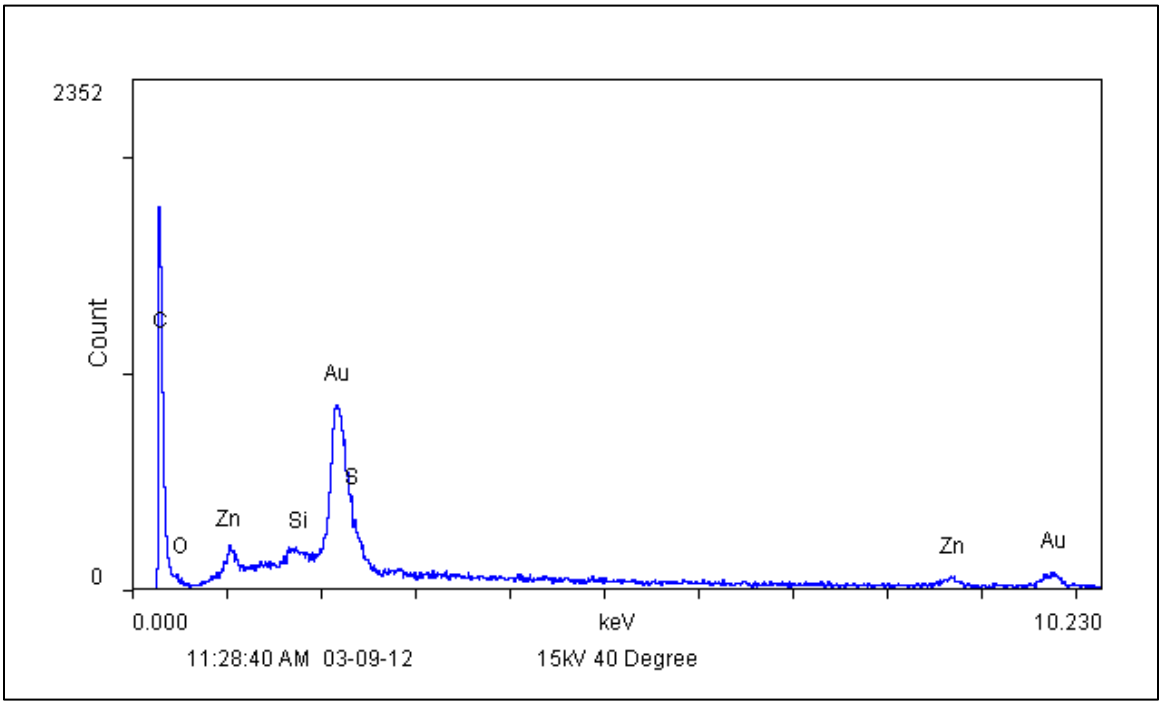

Figure 1d – EDS spectrum obtained from the sample 1 bulk rubber – Major elements (>10%) – carbon; Moderate elements (2-10%) – zinc, oxygen, sulfur; Minor elements (0.2-2%) – silicon

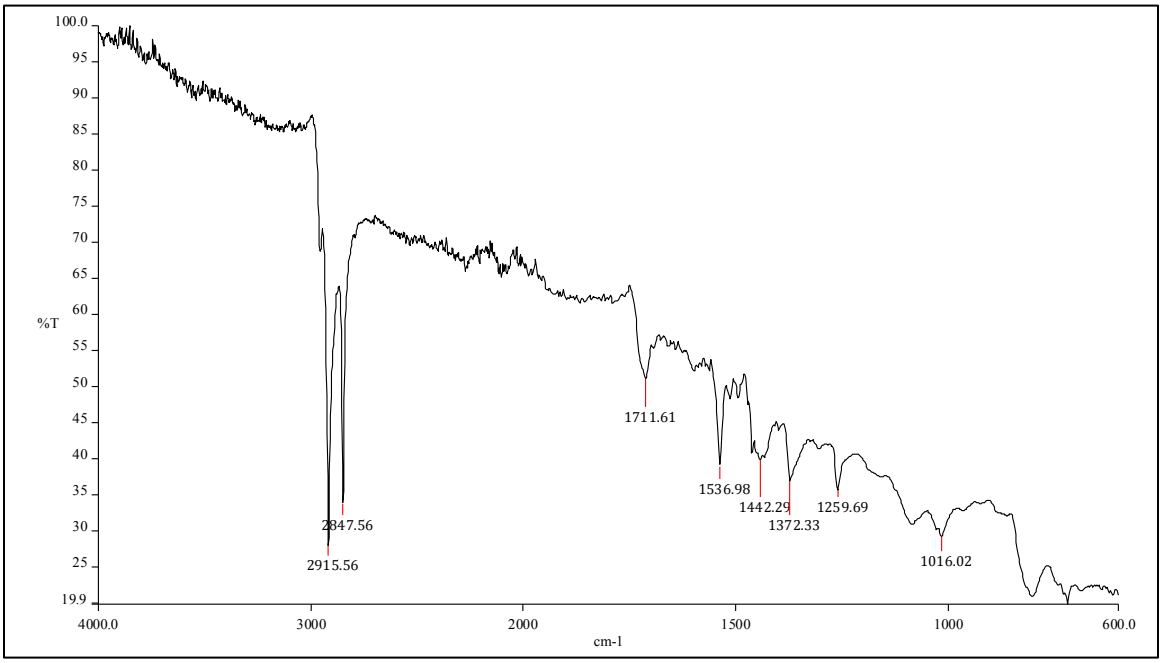

Figure 1e – FTIR spectrum obtained from sample 1 split face

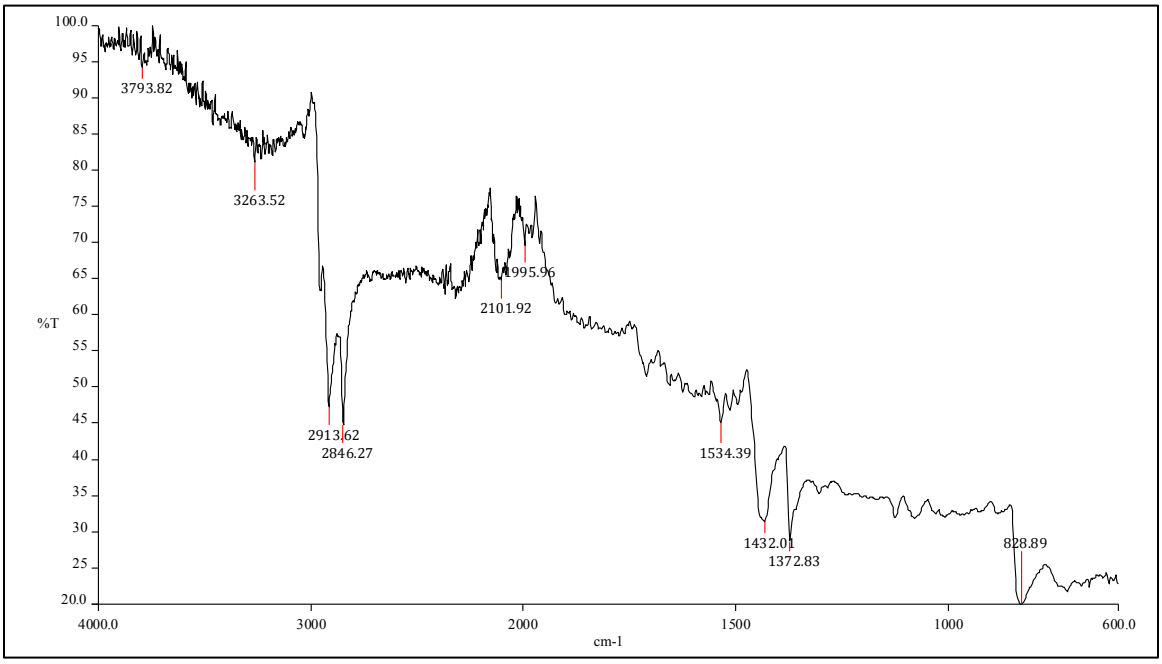

Figure 1f – FTIR spectrum obtained from sample 1 bulk

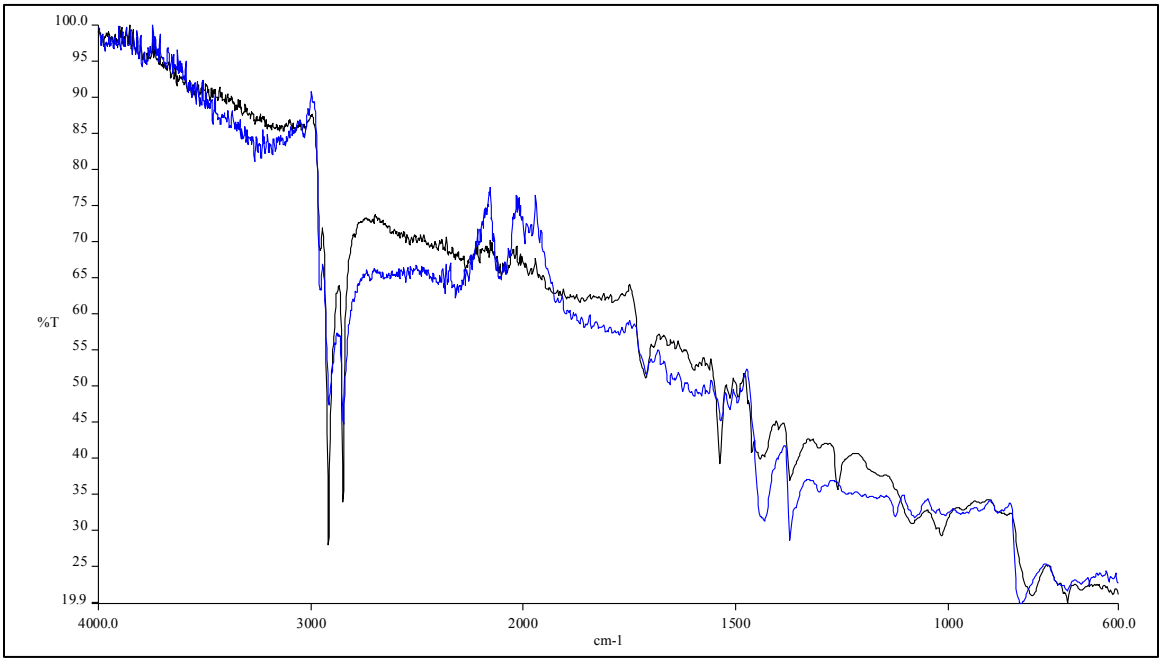

Figure 1g – Overlay of figure 1e and 1f

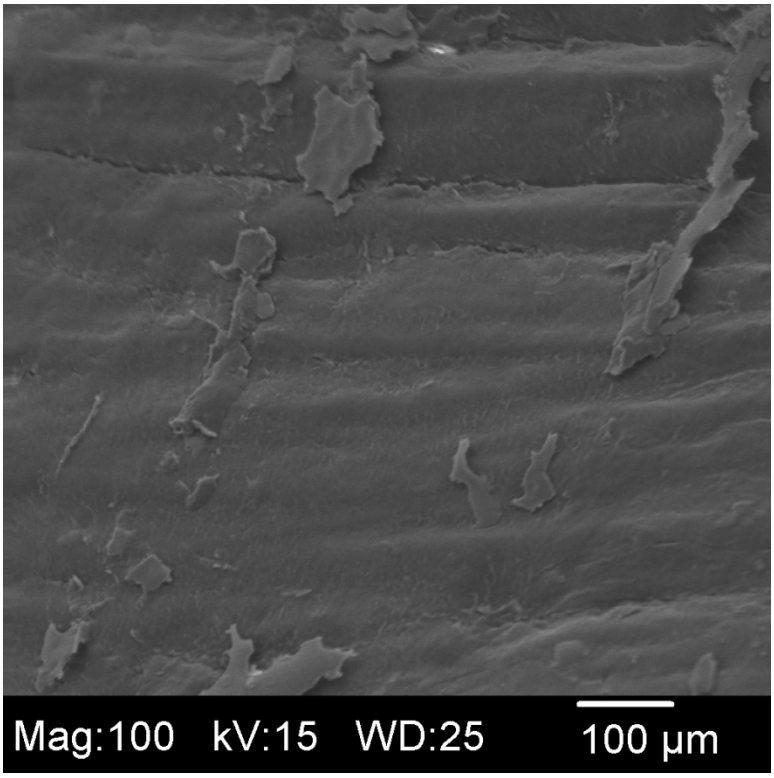

Figure 2a – SEM photomicrograph obtained from the sample 2 split face at 100X magnification

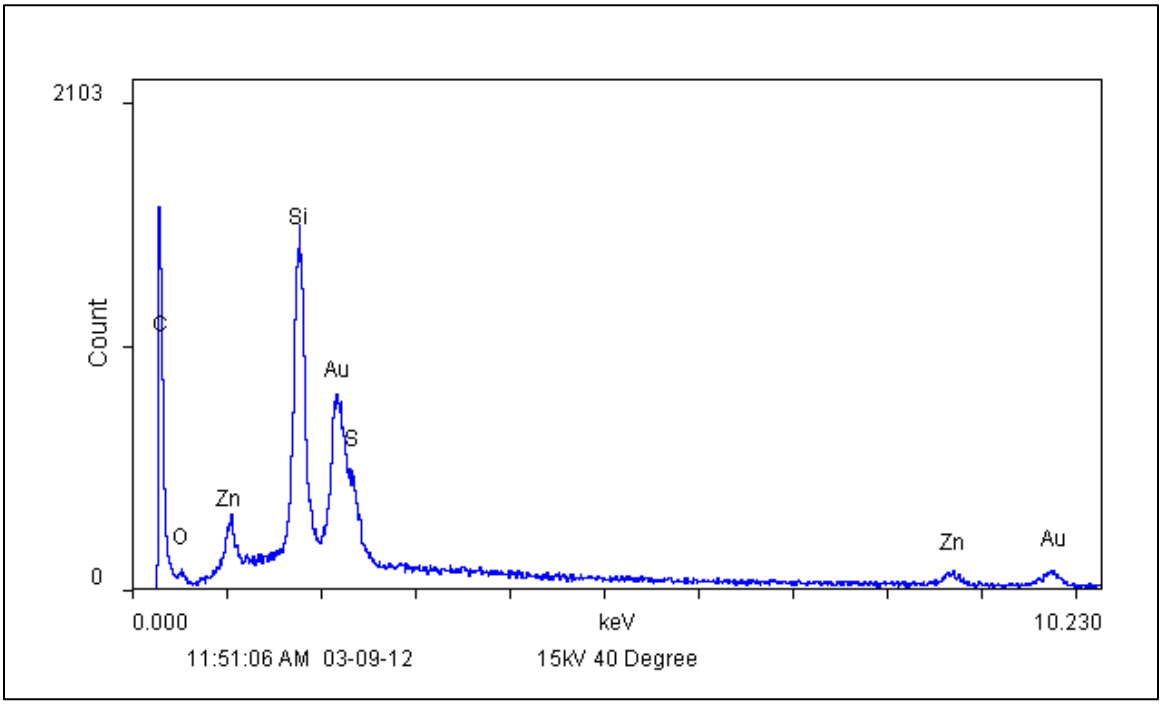

Figure 2b – EDS spectrum obtained from the sample 2 split face – Major elements (>10%) – carbon, silicon; Moderate elements (2-10%) – zinc, sulfur, oxygen; Minor elements (0.2-2%) - none

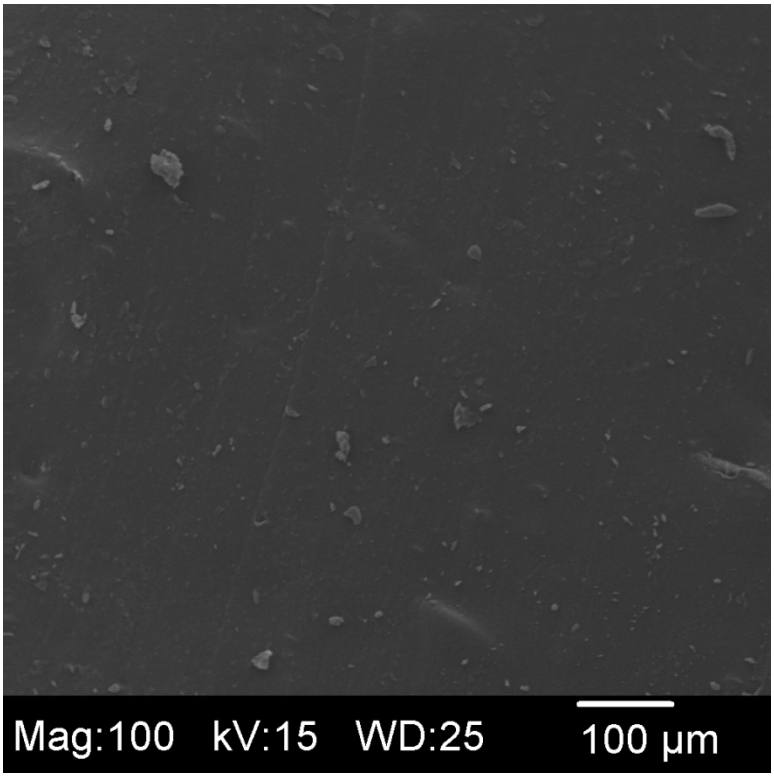

Figure 2c – SEM photomicrograph obtained from the sample 2 bulk rubber at 100X magnification

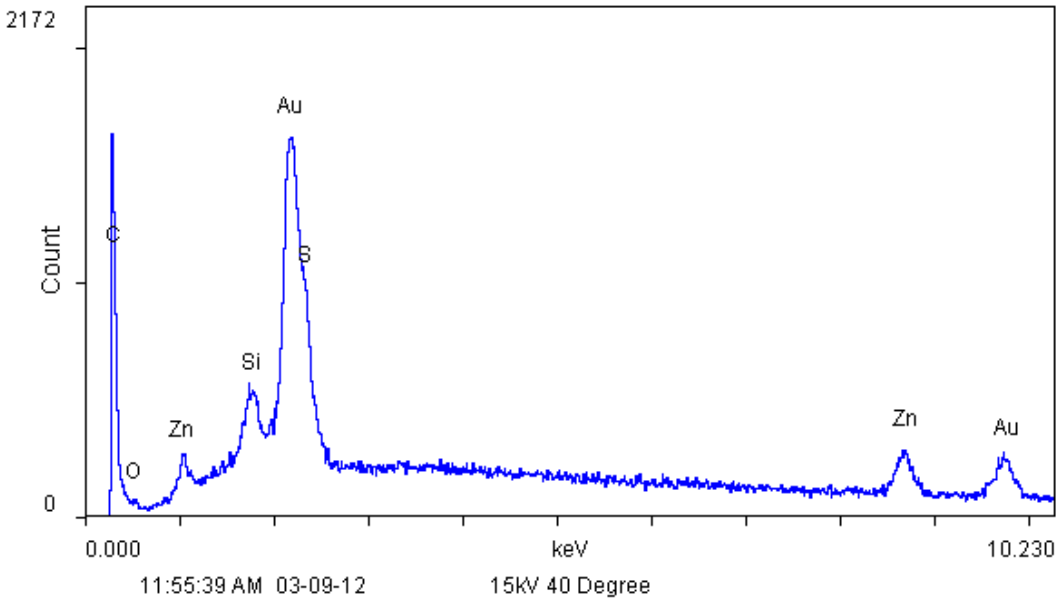

Figure 2d – EDS spectrum obtained from the sample 2 bulk rubber – Major elements (>10%) – carbon; Moderate elements (2-10%) – zinc, oxygen, sulfur; Minor elements (0.2-2%) – silicon

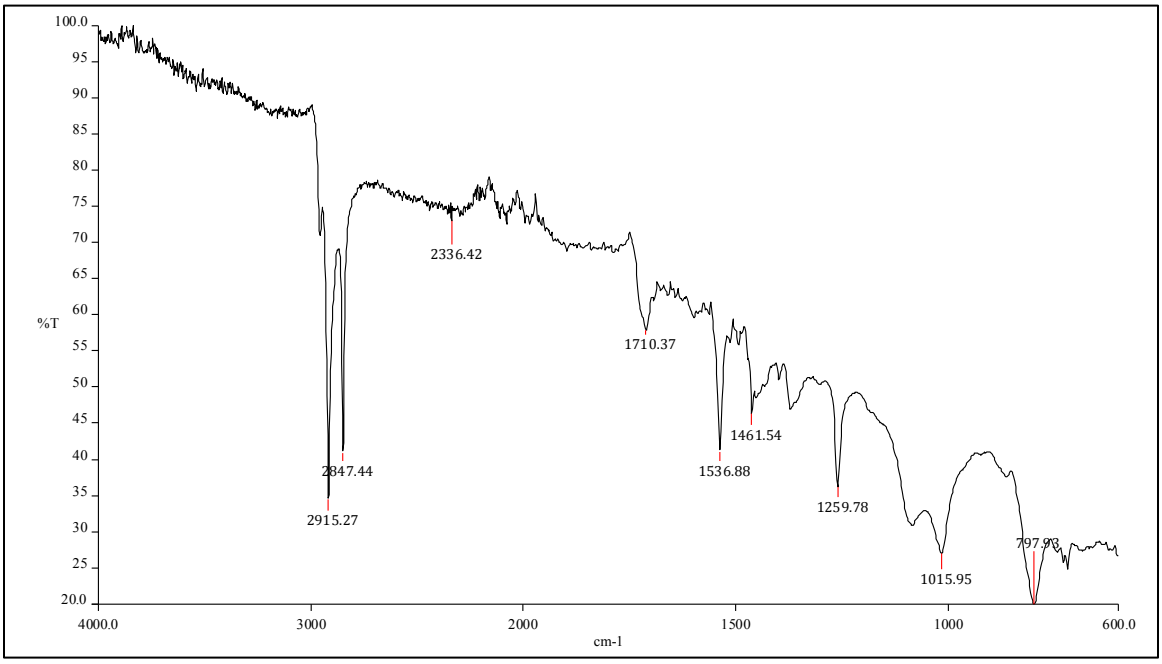

Figure 2e – FTIR spectrum obtained from sample 2 split face

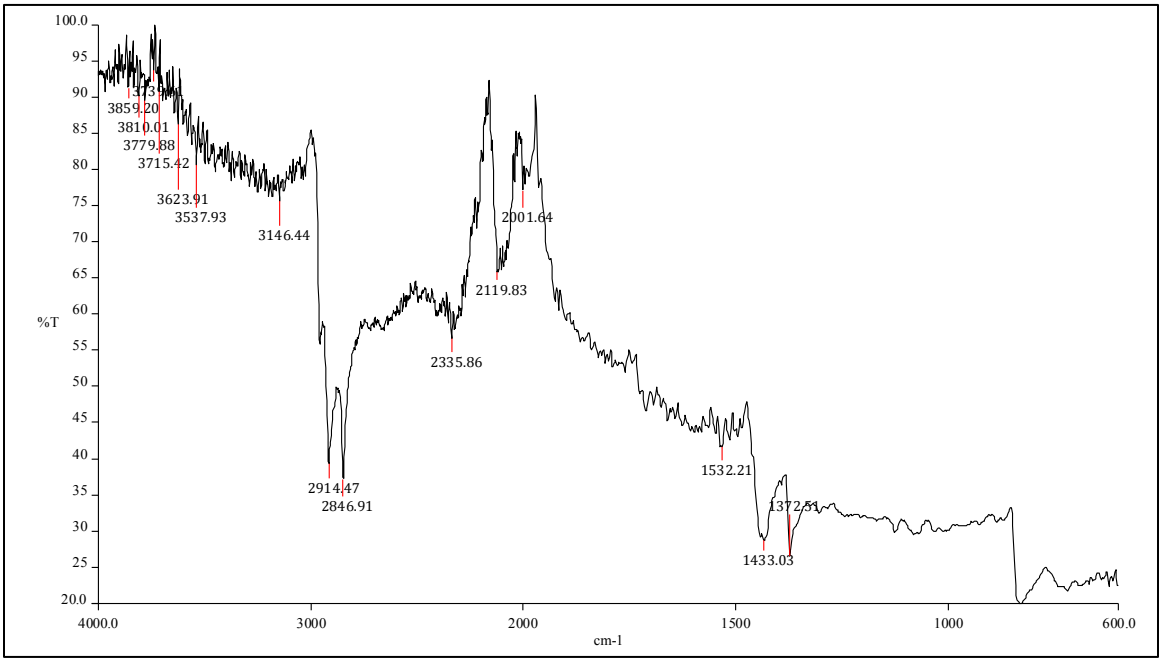

Figure 2f – FTIR spectrum obtained from sample 2 bulk

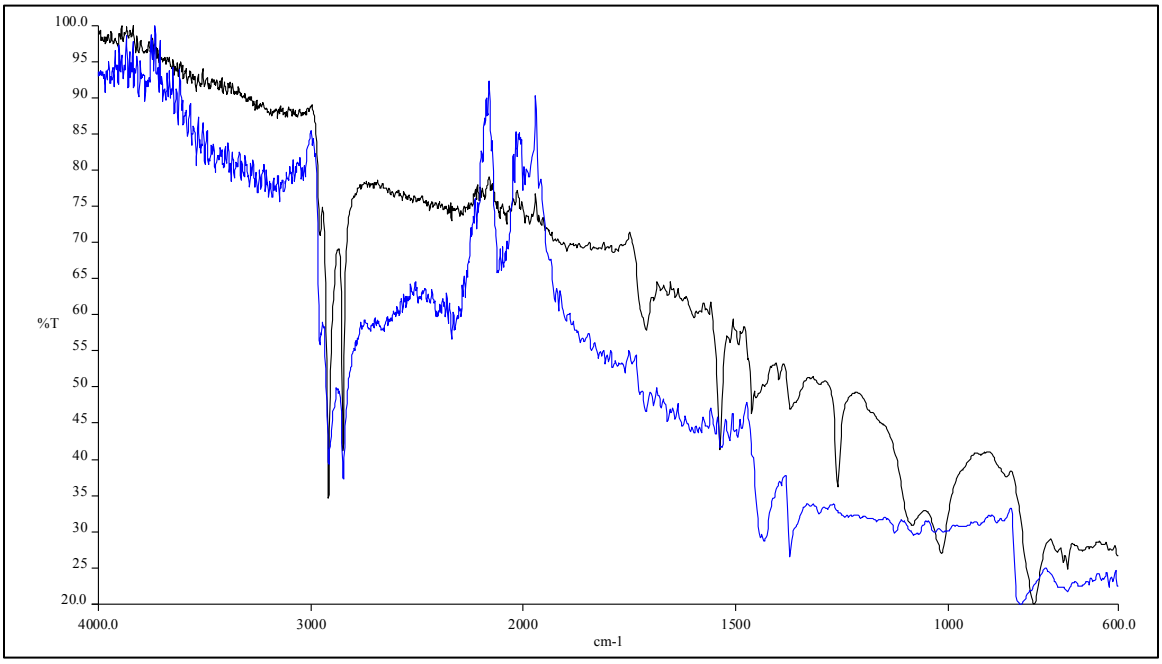

Figure 2g – Overlay of figure 2e and 2f

Conclusion:

The two samples were cut to reveal the split faces and examined at this surface. In addition, a bulk rubber section was cut from both samples for comparison. SEM analysis of the split face surfaces indicates a "ripple" morphology. EDS analysis of the split face surfaces compared to the bulk rubber indicates a relative decrease in carbon level compared to the other solids components and a large increase in silicon levels. FTIR analysis of these surfaces compared to the bulk rubber indicates enhancement of the polymeric functionality when compared to the IR absorbing background and presence of extraneous silicone functionality.

Based on the provided analysis, there is an indication of a silicone rich organic material present at the split face surfaces and a decrease in the carbon black filler relative to the polymer system, as evidenced by decrease in carbon level and enhancement of polymer functionality.