High entropy alloys (HEAs) are multi-component, near equimolecular alloys that potentially could be used to replace traditional alloys. HEAs have advantages over traditional alloys due to their reduced precipitate formation at higher temperatures and their potential reduced cost due to cheaper alloying components. In this study, we examine an Al0.1CoCrFeNi HEA after friction stir-processing (FSP) using scanning electron microscopy (SEM) and synchrotron X-ray diffraction mapping. Due to the high spatial resolution and high intensity of the synchrotron X-ray beam, it is possible to accurately determine the crystal structure, crystal lattice d-spacings, lattice strains, and texture associated with processing for each of the individual phases present. We present phase and elastic lattice strain maps across the interface between an unprocessed cast region and a FSP region for multiple crystallographic (hkl) reflections from the two phases present.

As illustrated in Figure 1, elastic lattice strains as a function of position shows that the 1st FCC phase in the FSP region is in compression in the $\varepsilon_{11}$ direction and in tension in the $\varepsilon_{22}$ direction. This research is an important first step in understanding the mechanisms of friction stir-processing of HEAs.