**Supplementary Information**

A histogram of the distribution of the voxel intensity values is presented in Figure S1 for the μXCT reconstruction of the 2DLSI\_A sample after failure. The values are on an 8-bit grey level ranging from 0 to 256. The first peak at 110 in the histogram corresponds to the background (air) volume located outside of the sample. This background was not included in the segmentation process.

Carbon is identified from careful inspection of the image grey levels as being associated with the shoulder at 125, whilst SiC is associated with the peak at 172. Through inspection of the images as a function of the grey level as well as analysis of the intensity histogram, a minimum (lower bound) threshold of 105 and a maximum (upper bound) threshold of 160 were determined for carbon. Similarly, the minimum and maximum grey level values for SiC, were found to be 136 and 190 respectively. Due to the limited spatial resolution and polychromatic nature of the source, the grey level intensity peaks associated with both carbon and SiC are very broad, this makes determining the exact location of the minima between the two peaks for segmentation challenging (Pal & Pal, 1993). The uncertainties quoted on the volume fractions given in the text, are calculated from the lower and upper bound values for grey levels associated with carbon and SiC.

Additional example information is presented in Figure S2 showing how the SiC content identified in the images varies between the lower and upper bound grey level thresholds, leading to an uncertainty of ± 14% on the value for the SiC vol. These upper and lower bound grey level values are illustrated in Figure S1 by the dotted lines.

Figure S1. Histogram of voxel intensity values for sample 2DLSI\_A with the upper and lower value of the grey level threshold for SiC indicated by the dotted lines.

Figure S2. Example segmented slice from the 2DLSI\_A sample, the SiC identified in the sample is shown outlined in yellow. The corresponding grey level threshold value and SiC content percentage are shown in the columns on the right-hand side.