Experimental report

The aim of this proposal is to elucidate electronic, chemical and structural changes on the local scale for transition-metal cations in Li-rich cathode materials at different states of charge and for varying dis-/charge rates *via* time-resolved *in situ* X-ray absorption spectroscopy (XAS) in order to investigate the impact of the dis-/charge rate on the Li^+ de-/insertion path, i.e., the concurrent structural changes, charge compensation and capacity fading mechanism. For this purpose, in situ XAS measurement were conducted at Mn, Co and Ni K-edges for the lithium rich cathodes at based cell. The normalized absorption spectra at Mn, Co and Ni K-edges at selected voltage states can be seen in Figure 1 and Figure 2. Unfortunately, no changes can be observed at both Mn, Co and Ni K-edges for the cell during the first charge and relaxation process. It seems that the X-rays destroyed our sample and the active materials loss their activity. Although we do not get the results which we want, it is still helpful for us to design the experiments at this beamline for future.

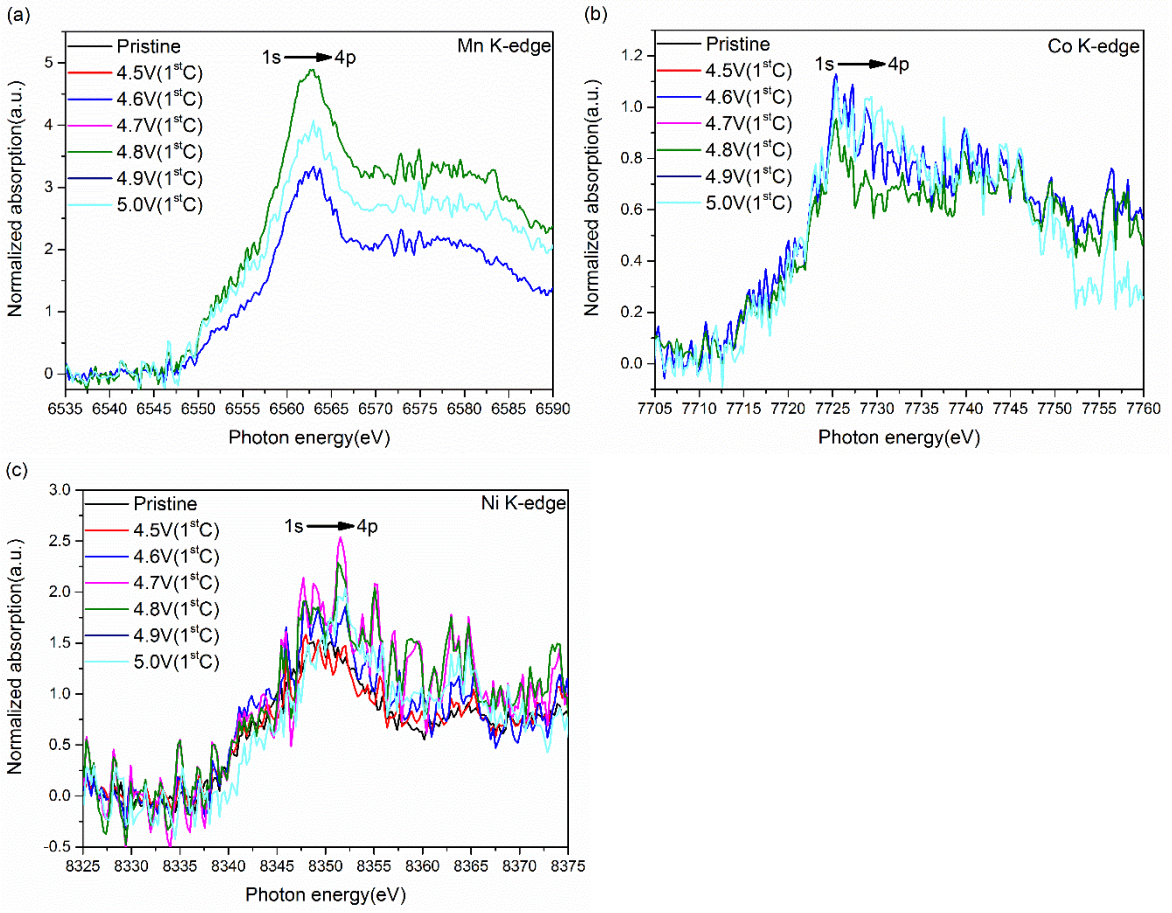

Figure 1. Normalized in situ XANES spectra at Mn, Co and Ni K-edge for the Li-rich cathodes at various state-of-charge in the 1st charge cycle. Charge rate: 2C.

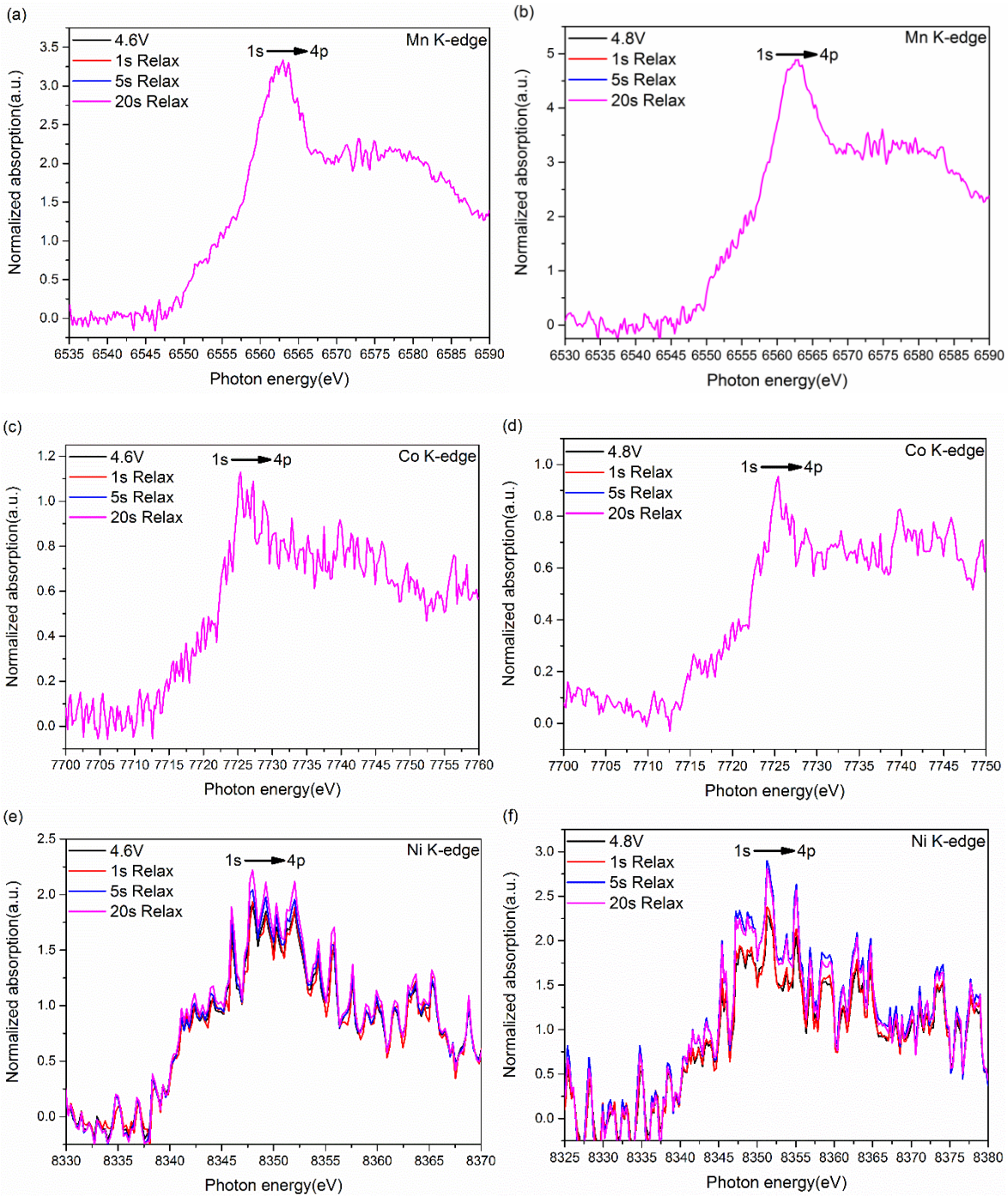

Figure 2. Normalized in situ XANES spectra at Mn, Co and Ni K-edge for the Li-rich cathodes relaxed at 4.6V and 4.8V. Charge rate: 2C.