



Graphical abstract. Figs (a-e) BSE-SEM images of before and after exposure respectively showing the changes in the microstructure and Fig (c) shows the STEM foil of the lift out of the preferential oxide formed between the Co-rich matrix and Cr-rich carbide. Fig (d) AFM contact-mode current map the Co-rich matrix conducts the highest amount of current, followed by the $M_{12}C$ with the Cr-rich carbide conducting the least current and Fig(e) BSE-SEM image of the region where the AFM was conducted.