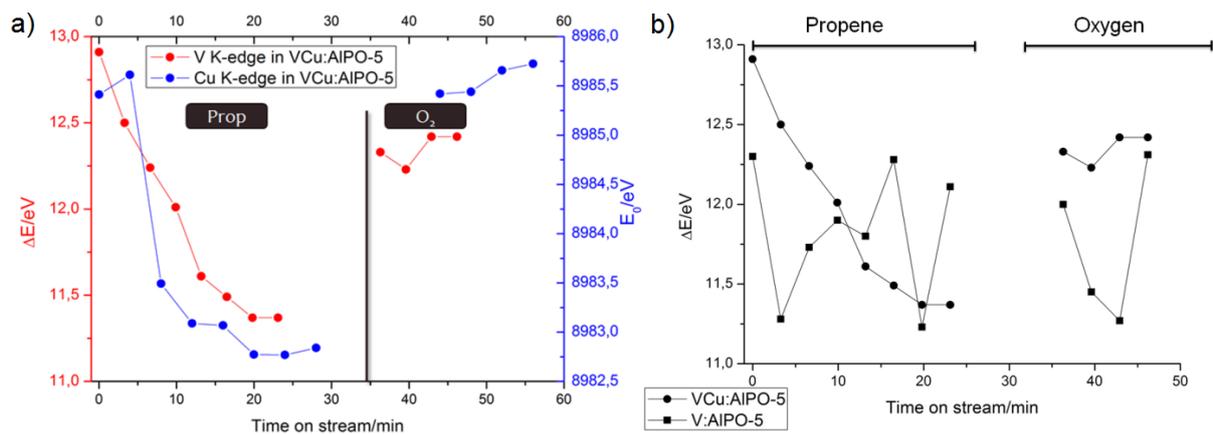


Beamtime Report CRG 01-01-889  
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We wished to investigate the co-operative effect of having introduced copper and vanadium in AlPO-5 by deposition (VCu:AlPO-5), and study the materials for selective oxidation of propene. Previous studies have suggested a synergistic effect of copper and vanadium for the epoxidation of propene.<sup>1</sup> Prior to the beamtime catalytic measurements were performed in a plug-flow reactor with a GC-MS at the outlet to determine the activity towards the aforementioned reaction.

*In situ* XAS measurements were done at the copper k-edge in transmission mode, and at the vanadium k-edge in fluorescence mode, to monitor the speciation of copper and vanadium during the reaction. Experimentally the reaction was studied by switching between propene (1.11 %) and oxygen (5 %) at 350°C and 450°C, while collection XAS. X-ray diffraction was collected at the end point to detect phases appearing during the reaction. The cycling between propene and oxygen is of importance in order to elucidate the variation in valence state as oxidation reactions are rapid, and XAS will only give a sum of the alterations that occurs during reaction. Figure 1a show the variation in valence state for VCu:AlPO-5 at the copper and vanadium k-edge at 350°C. The reduction of vanadium and copper occurs simultaneously in propene, and re-oxidises in oxygen. In order to investigate if there is a synergistic effect between copper and vanadium, a reference of AlPO-5 containing only vanadium (V:AlPO-5) was exposed to the same procedure. From figure 1b it is clear that there are no consistent changes in the valence state of vanadium in V:AlPO-5, concluding that copper is a necessity for the reduction of vanadium. The catalytic measurements also confirmed a higher activity and selectivity towards acrolein for VCu:AlPO-5, a desired product from the selective oxidation of propene.<sup>2,3</sup> Henceforth there exist a synergistic effect between copper and vanadium for the selective oxidation of propene.



**Figure 1 a) Variation in valence for vanadium and copper in VCu:AlPO-5, b) Variation in valence for vanadium in VCu:AlPO-5 compared to V:AlPO-5**

**References:**

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