

## **Investigation of the nature of the oxidant (selective and unselective) in/on a vanadyl pyrophosphate catalyst**

### **Abstract**

The anaerobic oxidation of CO by a (VO)<sub>2</sub>P<sub>2</sub>O<sub>7</sub> catalyst has been used to investigate the nature of the oxidant (selective and unselective) in/on that material. Three peaks were observed in the rate of production of CO<sub>2</sub> - at 993, 1073 and 1093 K. The temperature of the maximum in the rate of production of the first CO<sub>2</sub> peak and the amount of oxygen associated with it are the same as that observed in the selective anaerobic oxidation of n-butane to butene and butadiene, but-1-ene to butadiene and furan and but-1,3-diene to dihydrofuran, furan and maleic anhydride. The interaction of CO with the (VO)<sub>2</sub>P<sub>2</sub>O<sub>7</sub> catalyst forming CO<sub>2</sub> at 993 K is therefore concluded to be with the selective oxygen. The total amount of oxygen removed by the CO from the (VO)<sub>2</sub>P<sub>2</sub>O<sub>7</sub> lattice (>5 monolayers) is about six times greater than that of the selective oxygen. The higher activation energies for the removal of the unselective oxygen accounts for the high selectivities (~80%) encountered commercially for the anaerobic oxidation of n-butane to maleic anhydride. Re-oxidation of the CO reduced (VO)<sub>2</sub>P<sub>2</sub>O<sub>7</sub> by N<sub>2</sub>O quantitatively replaces all of the lattice oxygen removed by the formation of CO<sub>2</sub>, but does not restore the original morphology.