INVESTIGATIONS ABOUT GAS PHASE OXYGEN SPILLOVER

E. Baumgarten and A. Schuck
Institut für Physikalische Chemie und Elektrochemie
Heinrich-Heine-Universität Düsseldorf
D-40225 Düsseldorf

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Abstract

The possible role of gas phase transport in oxygen spillover has been investigated by two methods based on different principles, viz.:
1. Comparison of CO₂ formation at different temperatures (570 - 830 K) using GC;
2. Imaging experiments (burning of carbon opposite to a characteristic pattern of Pt, evaporated to glass.
Both techniques clearly show that activated oxygen (probably oxygen atoms) may migrate via the gas phase and react with carbon.

Keywords: Oxygen spillover, gas phase spillover, coke burning and spillover

INTRODUCTION

In earlier investigations [1-3] we discussed oxygen spillover from platinum on alumina to benzoic acid (adsorbed on alumina) or to carbon in the form of graphite or different carbon blacks. In these cases we could not obtain information about the mechanism by which the activated oxygen particles migrate from the metal to the oxidizable substance. In case of hydrogen spillover, on the other hand, we could show that transport of hydrogen atoms via the gas phase contributes to the spillover effect [4, 5]. Thus the question arose whether even oxygen atoms may migrate via the gas phase.
EXPERIMENTAL

The reactor used for the kinetic measurements is shown in Fig. 1. A central glass rod was etched with HF, and then Pt was deposited on the etched area by impregnation with $\text{H}_2\text{PtCl}_6$, and reduction in flowing hydrogen at 723 K. Two outer glass half shells were sooted with a paraffin flame and were heated to the reaction temperature in helium, to evaporate any volatile substances before starting the experiments. The platinum containing zone could either be positioned directly opposite to the soot zone, at 4 mm distance, or it could be moved to either side to see the influence of the relative position on the conversion of oxygen pulses.

![Diagram of reactor](image_url)

Fig. 1. Reactor for kinetics measurements of $\text{O}_2$ spillover