

THE DEGASSING PRODUCTS OF A HIGH SURFACE AREA GRAPHITE
AS MEASURED BY A PARTIAL PRESSURE MASS SPECTROMETER

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A mass spectrometer system is described which was specifically designed to measure the decomposition of the surface oxygen complexes on a high surface area graphite. In order to eliminate the possibility of oxidation reactions a batch sampling system was used, with a larger sample weight than is necessary in the more conventional direct monitoring systems used in previous carbon/oxygen studies. This involves a number of corrections such as dosage, ^{and} temperature magnification terms if the apparatus is to be used effectively as a selective mass balance. Rate data as well as cumulative curves can be obtained directly.

A ground Acheson Colloids graphite of specific surface $104 \text{ m}^2 \text{ g}^{-1}$ (by nitrogen BET measurement) was heated between 20-1000°C and the cumulative and rate data obtained for the evolved gases. CO and CO₂ were greatly in excess of the other gases and for this reason results are given for the original surface and the re-oxidised surface. These are compared to published work on weight loss data for very similar ground graphite. The extent of the complex removed at various temperatures has been calculated in terms of possible values of active surface. The total surface from X-ray diffraction line broadening was $131 \text{ m}^2 \text{ g}^{-1}$ and the ratio of basal plane to edge plane gives an active surface of $60 \text{ m}^2 \text{ g}^{-1}$ which compares with the order of $50 \text{ m}^2 \text{ g}^{-1}$ active surface obtained from the mass spectrometer data. Various modifications of these values are possible according to which total surface is used and to how the oxygen could be sited on the surface.

The rate data measures directly the linear relation between CO and CO₂ rates obtained by Duval. There is evidence that the Elovich law is obeyed in the later stages of desorption. These results differ to some extent from previous data in that each experimental point is an incremental ΔP from approximately 10^{-4} mm.Hg .

The cumulative and rate data and their variation with temperature are discussed in terms of possible arrangements of oxygen on the active surface, particularly as it has been suggested that the initial high rates are due to an excess oxidation of the active surface.