heating than on quenching. The difference is connected with differences in the number of nucleation sites in the two cases.

ELECTRON MICROSCOPY

Ion Erosion for Non-metals

from our Materials Science Correspondent

REPLICAS have had their day. Probably nine-tenths of electron micrographs nowadays are made from thinned foils, and nine-tenths of those from metals. Many ceramists, mineralogists and glass scientists would gladly make more use of electron microscopes if the problems of thinning down specimens were less daunting. With inorganic compounds that are lamellar in form and cleave easily, there is no problem, but run-of-the-mill oxides have been troublesome. Some people have used mechanical grinding, others have experimented with chemical thinning—often with indifferent success—and some in desperation have become crystalloclasts and taken to using a pestle and mortar.

Several investigators have profited from the current interest in ion erosion to develop a new method of thinning non-metallic samples for electron microscopy. It has been described independently by D. J. Barber (*J. Materials Sci.*, **5**, 1: 1970) and H. Bach (*J. Non-Cryst. Solids*, **3**, 1: 1970), who concerns himself largely with glasses. Both use focused beams of argon ions at 5–7 kV energy to erode material from the sample surface at nearly glancing incidence. The principal difference between the two scientists is that one erodes one side only, while the other simultaneously bombards from both sides, using a cold finger to inhibit redeposition of sputtered atoms. The apparatus is simple—Barber's is the simpler of the two, and equally effective—and there appears to be no problem about heating of the sample, or controlling the process. The two reports contain several micrographs of glasses and crystalline compounds such as olivine, alumina, quartz and lithium fluoride, as well as some thin films sectioned transversely.

Glasses do not give good micrographs if they are truly vitreous, for lack of contrasting features, but with many samples it is possible to see incipient or advanced breakdown into two glassy phases or into a crystalline phase dispersed in a vitreous matrix. These features show up well, while larger inclusions are revealed by a sort of self-shadowing in the ion beam. Barber reports no problems with crystalline materials, but Bach has found that in some cases the surface layers lose their crystallinity because of radiation damage by the ions. This was clearly revealed by electron micrographs made of ion-eroded quartz, but lithium fluoride was immune. It will plainly be important in this respect to separate the sheep from the goats.

Ion erosion has also been used to remove successive layers from the surfaces of samples in a scanning electron microscope, to permit examination of structures in depth. D. Kynaston, working with a Stereoscan (*New Scientist*, **45**, 256; 1970), has obtained micrographs with the help of a small ion source built into the microscope's specimen chamber; he has applied the technique to both inorganic and biological specimens.

Barber, Bach and Kynaston have all used compact cold cathode sources operating with a glow discharge, which represents a cheap and simple way of obtaining focused beams of ions at moderate energies. It is to be hoped that some enterprising manufacturer will soon market an inexpensive device for conventional electron microscopists—it seems that scanning electron microscopists will soon be provided for.

PLANETARY ATMOSPHERES

Stain in the Clouds of Venus

by our Astronomy Correspondent

THE clouds which perpetually obscure the surface of Venus have been reported to be tinged with yellow, but the notion arising therefrom that the clouds are essentially carbon suboxide, C_3O_2 , is scotched in the current number of the *Astrophysical Journal* by W. T. Plummer and R. K. Carson of the University of Massachusetts (**159**, 159; 1970). The possibility that carbon suboxide plays an important part in the atmosphere of Venus has been entertained at various times since the 1950s, but Plummer and Carson show that this is at variance with the infrared evidence.

They have prepared carbon suboxide frost in the laboratory and shown that its infrared reflexion spectrum differs from the spectrum of Venus. Although in the atmosphere of Venus carbon suboxide is likely to be liquid rather than solid, Plummer and Carson say that frost spectra are a good substitute for the spectra of a cloud of droplets. Their measurements show that between 1 and 3 microns the reflexion spectrum of carbon suboxide in general agrees with the Venus spectrum, but there are some important differences.

For example, a prominent carbon suboxide absorption feature at 2.25 microns is absent from the Venus spectrum, and Plummer and Carson say that this could only happen if the size of the droplets is suitably small, less than 0.1 micron across. Particles this small are eliminated by polarization measurements of Venus.

Although this seems to rule out carbon suboxide as an important component of the clouds, the point about carbon suboxide is that the monomer which is white in the solid state gradually polymerizes to a yellow, red or brown variety, with the possibility that the clouds might be made up of a polymer, thus explaining the yellow tinge. It is clear, however, that a faint yellow polymer of carbon suboxide cannot form the bulk of the clouds. For one thing, the chemical evidence is that all the polymers have a high reflectivity in the infrared region contradicting the region of low reflectivity in the Venus spectrum which begins on the low wavelength side at about 2.6 microns. What is more, Plummer and Carson say that the effect of ultraviolet light is to continue the polymerization until the product is a deep brown colour which is not likely to go unrecognized. To maintain the whiteness of the clouds the monomer would have to be continually replenished, but this is forbidden by the absence of the 2.25 micron feature. Clearly carbon suboxide is now properly ruled out as a major constituent of the enigmatic clouds—it was never a strong contender—but it is still feasible that a small amount of a polymer