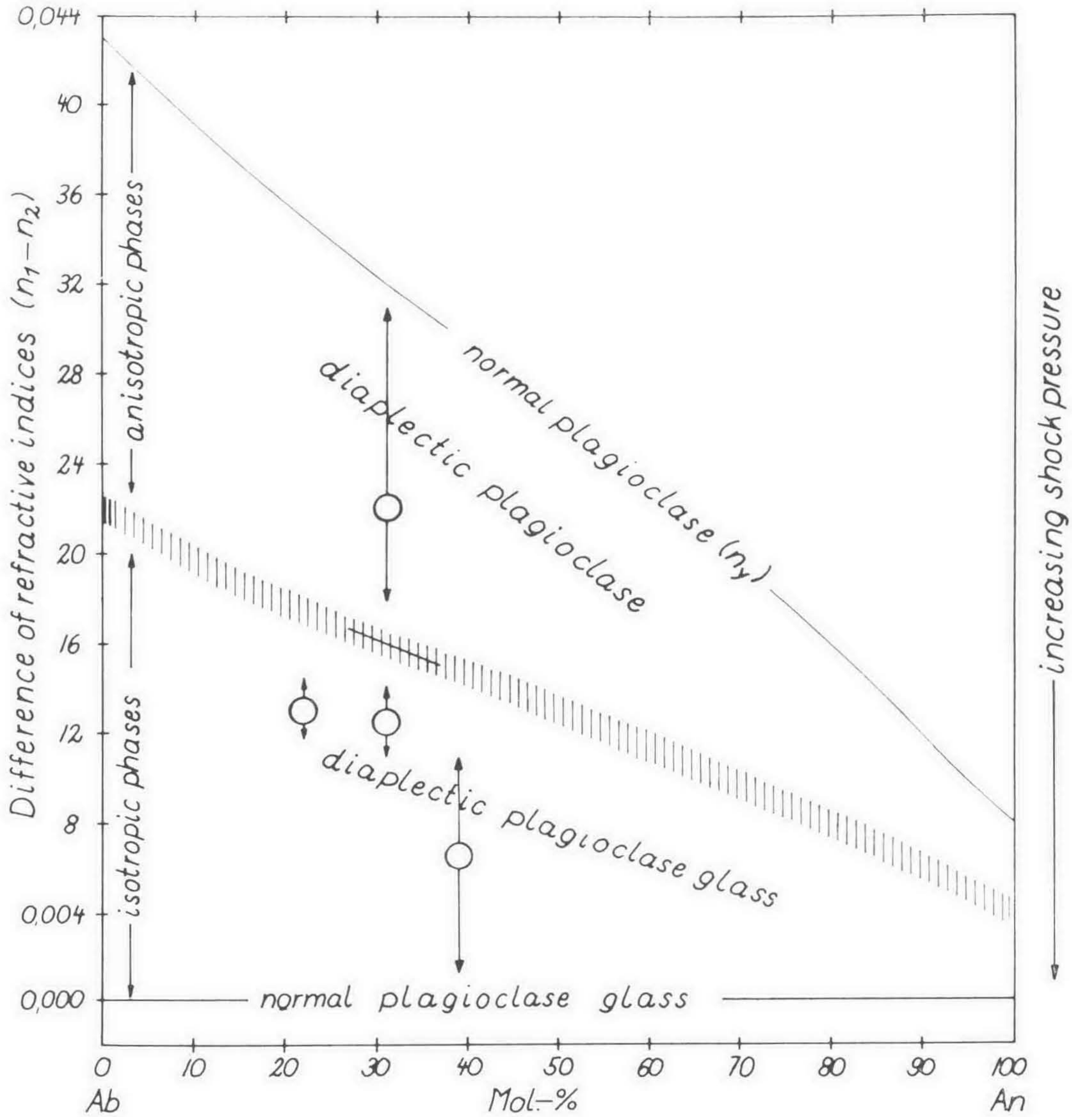

Fig. 5. States of plagioclase in shock metamorphism (Stöffler, 1967). n_1 is the refractive index or mean refractive index of the shocked phase; n_2 is the refractive index of normal glass of the same composition. Arrows indicate variation within 50 measured grains; circles indicate the calculated averages. The boundary between diaplectic crystalline and glassy phases is known only for An_{31} and has been extrapolated for the other compositions.

ical characteristics of the liquid state—e.g., vesicles (now filled with gas or secondary minerals) and schlieren. The refractive index of this glass does not appear to be different from that of normal synthetic or natural plagioclase glass. Milton and DeCarli (1963) produced plagioclase glass of bytownite composition (An_{80}) by shock loading gabbro in the estimated pressure range of about 600 to 800 kilobars. The refractive index of this glass (1.560) is similar to that of synthetic bytownite glass (1.557).

In the lower range of stage III, *quartz* is still present in the form of diaplectic glass, together with fused feldspar. At higher pressures, quartz

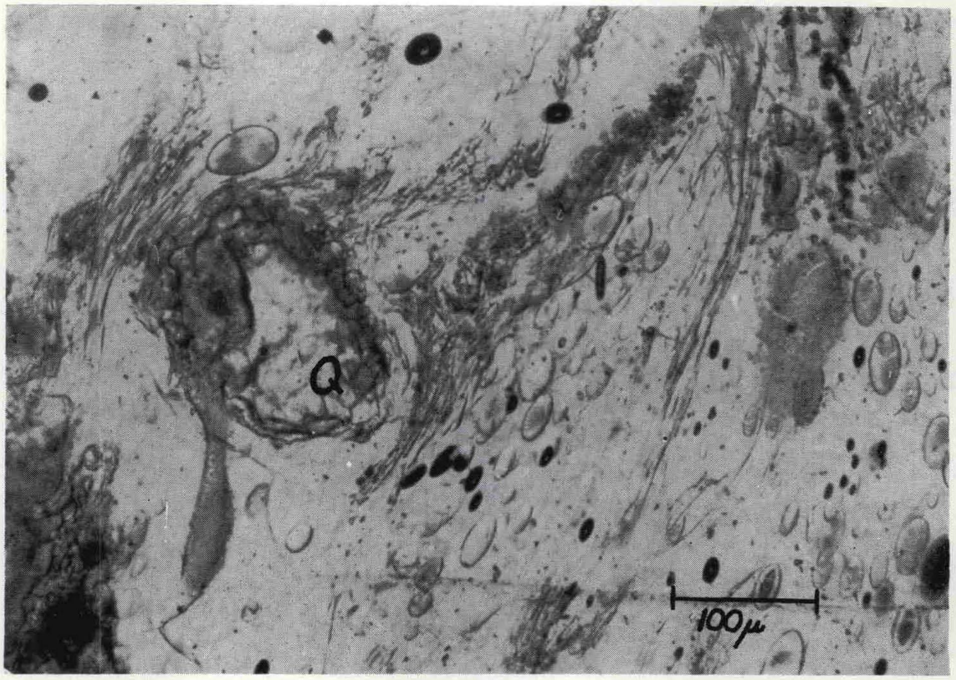

Fig. 6. Normal K-Na-feldspar glass, showing vesicles, schlieren, and an inclusion of quartz glass (Q), probably diaplectic. Specimen is from a fragment of crystalline rock (biotite gneiss?) from Otting.

also forms normal glass with all features of the liquid state. Coesite and stishovite occur in these glasses. The difference in shock melting of quartz and feldspar is apparently due to their different melting temperatures. No eutectic reactions between the minerals are observed.

Amphibole and *biotite* in stage III gradually lose birefringence and pleochroism and show decomposition to aggregates composed chiefly of opaque minerals. Shock-induced planar features or lamellar structures have been observed in amphibole, and they are now under investigation.

In stage III, the original texture of the crystalline rocks, which is still largely preserved in stages I and II, is destroyed. Partial melting and the formation of vesicles produce porous, pumice-like rocks.

STAGE IV

The so called *Fladen* (also *Flädle*), bodies rich in molten glass, belong to this facies. Their characteristic, generally flat, shapes (*Fladen* means "pancake") have been generated by aerodynamic forces during their rapid flight through the air, but the bodies were rigid and not deformed when they hit the ground. For details about their occurrence, shape, stratification, and chemical and mineralogical composition, see Hörz (1965) and Engelhardt (1967).

All *Fladen* contain many vesicles; they are mixtures of molten glasses and fine mineral fragments. Phases contained in the *Fladen* include unaltered quartz, diaplectic quartz, diaplectic quartz glass, molten quartz glass (lechatelierite), unaltered feldspars, diaplectic feldspars, normal feldspar glass, and diaplectic feldspar glass. Very few mafic minerals have been found among the mineral fragments. Quartz is the main constituent of the fragmental material (about 12 weight percent of the *Fladen*). In cross section the *Fladen* are seen to consist of multiple thin layers of glass, which are alternately poor and very rich in angular mineral grains. The texture suggests that a cooler "rock flour" has been embedded in a very hot, strongly flowing melt. The temperature then dropped quickly and movement stopped before melting of the mineral grains and complete mixing could be accomplished. The glass within the *Fladen* is heterogeneous and