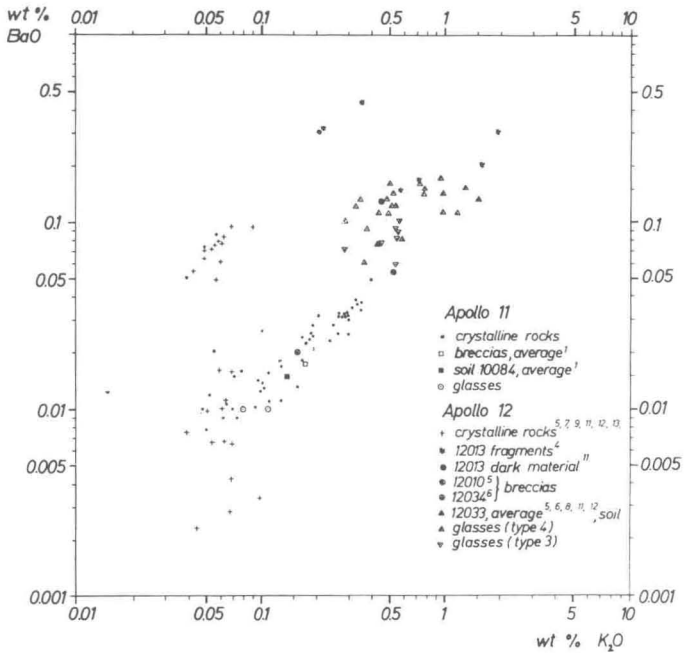

Fig. 7. BaO versus K_2O contents of glasses, igneous rocks, breccias and soil of Apollo 11 and Apollo 12. Glass analyses of this work are represented by triangles. Data of Apollo 11 glasses and crystalline rocks are taken from LEVINSON (1970) Vols. 1 and 2. References for all other data are designated by superior numerals and listed in caption of Fig. 8.

Therefore we conclude that a great number of glasses occurring in soils and breccias have not been produced by shock melting of basalts which are supposed to form the basement of the regolith at the landing sites. Source material of these glasses may be local soil and rocks from distant localities.

Discussing the nature of the source rocks of glasses attention has to be drawn to possible processes of local or selective melting in shocked crystalline rocks as they were observed in rock 12057,14. By such processes small glass particles of strongly different and aberrant compositions (Table 1) may be formed, which also may, to some extent, explain the broad scattering of points in the chemical composition plots. For this reason, one should be cautious in interpreting the compositional variability of basaltic glasses in terms of a discrete fractionation series of parent rocks.

Contrary to the broad variation in chemical composition of many angular fragments and regular bodies, the maroon-brown "KREEP"-glasses of Apollo 12 samples show a very narrow range of compositions (Table 4). In this respect and also by their morphology and texture, these glasses are similar to impact glasses from terrestrial suevites, such as the glass bombs of the Ries crater (ENGELHARDT, 1967). By their chemical composition the brown glasses may correspond to particular norites rich in K, P, and Zr analyzed by KEIL *et al.* (1971) and WOOD *et al.* (1971). The provenance of these glasses is discussed in the next sections.

direct shock evidence. Some of the very homogeneous regular glass bodies may have been formed by condensation from shock-produced silicate vapor.

Angular fragments and regularly shaped lunar glasses are considered to be cataclastic particles of quenched melts produced by impacts. They show a considerable variation of chemical composition which may be due to large scale impact melting of different parent rocks and/or to fusion of small volumes of rock or soil caused by small impacts. It may be concluded from the clustering of points in the plots in Figs. 5, 6, and 9 that main parent crystalline rocks were of "basaltic," "anorthositic," and "pyroxenitic" composition.

Most of the "basaltic" glasses of Apollo 11 and Apollo 12 are similar in composition to the soils but different from the large basaltic fragments (Figs. 5, 6, and 9).

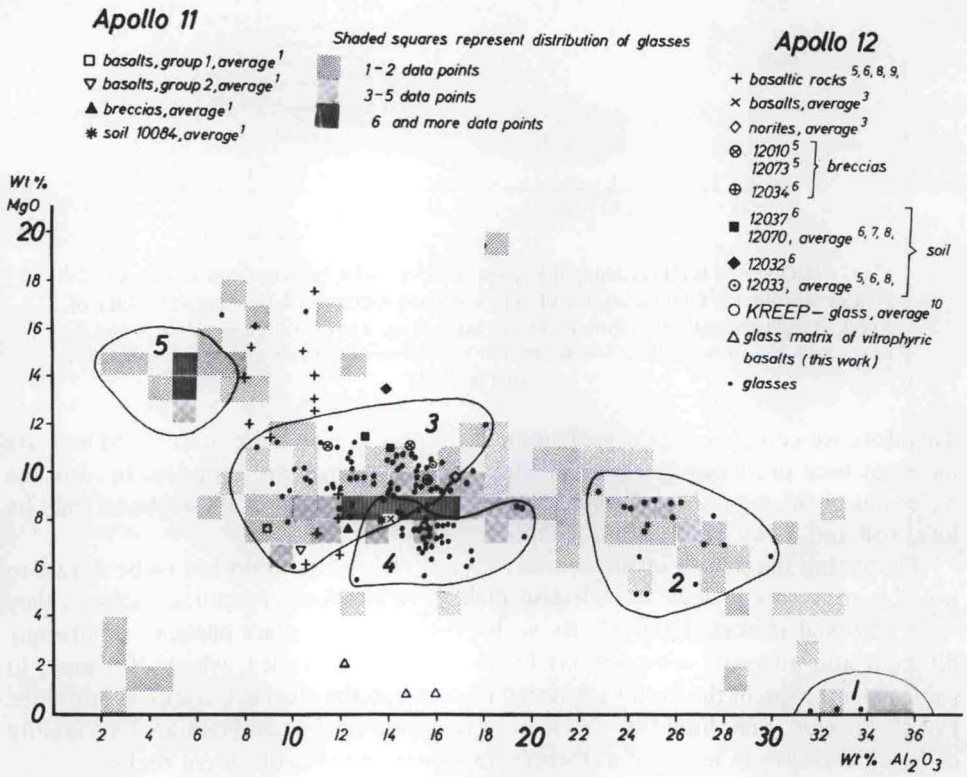

Fig. 6. MgO versus Al_2O_3 contents of glasses, igneous rocks, breccias and soil from Apollo 11 and Apollo 12. The data of Apollo 12 glasses of the present work together with the data of AGRELL *et al.* (1971), CHAO *et al.* (1970b), and KEIL *et al.* (1971) are represented by dots. Shaded areas represent the distribution of 222 data points of Apollo 11 glasses taken from LEVINSON (1970), Vols. 1 and 2. References for all other data are designated by superior numerals and listed in caption of Fig. 8. Area 1 = diaplectic plagioclase glasses; area 2 = "anorthositic" glasses; area 3 = "basaltic" glasses of Apollo 12; area 4 = maroon-brown ("KREEP") glasses of Apollo 12; area 5 = red-brown ("pyroxenitic") glasses of Apollo 11.