A PHYSICAL CHARACTERIZATION OF THE SLOAN DIAMONDS.

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The physical characteristics of diamonds from six kimberlite phases of the Sloan 1 & 2 kimberlite complex of the Colorado-Wyoming State Line kimberlite district have been investigated. Both primary and secondary features were described including crystal state (breakage), primary morphology, resorption morphology, primary and secondary mass/size, colour and surface features.

Approximately 50% of the Sloan diamonds are broken crystals. Considering primary morphology, three-quarters of the Sloan diamonds are inferred to have crystallized as single crystal octahedra, whereas a quarter crystallized as macle twins or simple aggregate crystals. Cubo-octahedral, cube and polycrystalline aggregate forms occur only in trace quantities. Resorption morphology is classified according to a method devised by D.N. Robinson (see Otter and Gurney, 1989) which allows a semi-quantitative calculation of the proportion of individual diamonds lost to resorption. According to the data, approximately 25% of the bulk Sloan diamond mass/volume was lost during resorption. The Sloan diamonds define a log-normal distribution with respect to secondary mass/size with 85 % of the stones weighing less than 0.03 carat. The largest diamond reported from Sloan weighs 1.24 carats (Shaver, 1988). A semi-quantitative calculation of primary mass for individual diamonds (whole crystals only) suggests that, before resorption, very few of the Sloan diamonds exceeded two carats in mass. With respect to colour, 70% of the Sloan diamonds are brown, 25% are grey and 5% are colourless. Pristine yellow, amber, pink and green diamonds occur only in trace quantities. A quarter of the Sloan diamonds display xenolithic surface features (e.g. knob-like asperities, surficial graphite, and non-uniform resorption) which suggests that a significant proportion (if not all) of the diamonds were derived by the disaggregation of xenolithic host rock materials. Only 2% of the diamonds exhibit lamination lines which are attributed to deformation. Resorption features (e.g. trigons, shield-shaped laminae, elongate hillocks) are common on the Sloan diamonds and late-stage features (resorbed breakage surfaces, frosting and corrosion scupture) are also documented.

Relationships between physical characteristics are observed. For instance, diamonds exhibiting the brown coloration were apparently more susceptible to breakage relative to diamonds of other colours. Finally, variation in diamond characteristics between kimberlite phases also is documented. For example, corrosion sculpture is extremely common on diamonds from the Sloan 2 kimberlite phase, but rare on diamonds from other kimberlite phases in the diatreme.

The significance of these data will be discussed with respect to the diamond crystallization environment(s) sampled by the Sloan kimberlite magma as well as environments encountered by the diamonds subsequent to growth, especially in the kimberlite itself.

REFERENCES

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