

motes surface graphitization, and decreases the regularity of etch pit geometry. The shape of etch pits produced during oxidation in chloride-rich compositions is very unusual for natural diamonds. The discrepancy between the morphology of diamond surfaces produced by oxidation in these fluids and those observed on natural diamonds suggest that chloride can only be present in limited concentrations in aqueous kimberlitic fluid.

An experimental investigation of diamond oxidation in Cl – H₂O fluids: implications for kimberlitic fluid composition

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Primary fluid and melt compositions of kimberlite are poorly constrained due to extensive mantle and crustal contamination, degassing on eruption, and post-magmatic alteration processes. Experiments show that diamond oxidation by kimberlitic fluid strongly depends on fluid composition. Oxidation of diamonds in magmas with H₂O-rich fluid, CO₂-rich fluid and in the absence of a free fluid phase, produces distinctively different features on diamond surfaces. Thus, diamond dissolution features can be used to investigate fluid composition in diamond-bearing magmas. Geochemical data from the Udachnaya-East kimberlite (Siberia) and fluid inclusions in phenocrystal olivines show high chloride content, implying that chloride may be an important component in kimberlitic systems. Comparison of natural diamond surfaces to those produced experimentally in chloride-bearing fluids provides a means of assessing the importance of chloride in kimberlitic systems. These experiments may also elucidate the mechanism of diamond oxidation.

Diamond dissolution experiments were performed in the piston-cylinder apparatus at 1350°C and 1 GPa in NaCl – H₂O and KCl – H₂O systems. Diamond surfaces were investigated by optical and field emission scanning electron microscopy. Results showed that an increase in the Na(K)Cl:H₂O ratio reduces oxidation at the edges of crystallographic faces, pro-