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Geochemical characteristics of impact glass from suevite of the Bosumtwi impact crater, Ghana, W. Africa

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The Bosumtwi structure is a well-preserved, young (˜1.07 Ma) impact crater in Ghana, W. Africa. It is the largest (Ø=10.5 km) known terrestrial impact crater with a central uplift. The Ivory Coast tektites and an offshore microtektite strewn field are related to this structure, which has now been in the focus of an International Continental Drilling Project (ICDP) that successfully ended in October 2004. Cores recovered during the drill campaign contain various brecciated sedimentary target rocks ranging from greywacke over shales to slates. Breccias reflect surprisingly low shock levels, i.e. glass shards and bombs are almost absent. On the contrary, impact glass particles are ubiquitous in fall-back suevites observed at the surface of the Bosumtwi area. These glass-rich suevites have been collected between Nyameani and Nkowinkwanta, north of the crater rim. To understand whether or not the glasses are derived from lithologies that are present in the drill cores and to obtain information on the cooling path of impact glasses we have inspected samples by petrographic microscopy, directly coupled-evolved gas analysis (DEGAS), and analytical transmission electron microscopy (ATEM). The suevites contain various glasses ranging from diaplectic quartz crystals with coesite over mineral glasses with fluidal texture to shards of vesicular "mixed" glasses with schlieren. DEGAS analysis of the latter glasses reveals the presence of minor concentrations of water (released at 320°C) and trace amounts of CO2, CH4, SO2 and H2, ordered according to decreasing abundance. Nanoscale ATEM observations show strong chemical heterogeneities. Glasses are exsolved into a silica-rich matrix and alumina-rich spherules, which is probably due to slow cooling

below the glass transition temperature. On average glasses are very rich in alumina (> 22 wt% Al2O3). High alumina contents are only compatible with staurolite-rich mica-schist clasts that are present in the same suevites.