OXYGEN ISOTOPES AS TRACERS OF TEKTITE SOURCE ROCKS: AN EXAMPLE FROM THE IVORY COAST TEKTITES AND LAKE BOSUMTWI CRATER C. Page Chamberlain and Joel D. Blum, Dartmouth Laboratories for Isotope Tracers in the Environment (DLITE), Department of Earth Sciences, Dartmouth College, Hanover, New Hampshire 03755; Christian Koeberl, Institute of Geochemistry, University of Vienna, A-1010 Vienna, Austria.

Oxygen isotope studies of tektites and impact glasses provide an important tool to help in identifying the target lithologies for terrestrial impacts, including the K-T boundary impact [1]. However, such studies may be complicated by modification of the original oxygen isotope values of some source rocks during the tektite formation process either by vapor fractionation [2] or incorporation of meteoric water [3]. To further investigate the relationship between the oxygen isotopic composition of tektites and their source rocks we have studied Ivory Coast tektites and samples of impact glasses and bedrock lithologies from the Bosumtwi Crater in Ghana–which is widely believed to be the source crater for the Ivory Coast tektites [4-7]. Our preliminary results suggest that the phyllites and metagraywackes from the Bosumtwi Crater were the predominant source materials for the impact glasses and tektites and that no significant oxygen isotope modification ($\leq$1‰ $\delta^{18}O$) took place during impact melting. This contrasts with previous studies of moldavites and Australasian tektites and their sedimentary source materials which suggests a 4 to 5‰ lowering of $\delta^{18}O$ due to meteoric water incorporation during impact melting [1,3,12].

In this study we have measured oxygen isotope values for each major bedrock lithology from the Lake Bosumtwi crater, impact glasses found at the crater, and Ivory Coast tektites. These data complement the original work by Taylor and Epstein [7], on the oxygen isotopes of the Ivory Coast tektites, which showed that the $\delta^{18}O$ values were the highest of any known tektites. Taylor and Epstein [7] suggested that the Ivory Coast tektites represent impact glasses from high $\delta^{18}O$ metasediments, soils, or deeply weathered granitic rocks which are exposed at the Bosumtwi Crater. At the time of Taylor and Epstein's study [7], however, there were no oxygen isotope data from the Bosumtwi crater target rocks for comparison.

The Bosumtwi Crater is an approximately 11 km diameter impact crater, which lies 300 km east of the Ivory Coast tektite strewn field. The bedrock is comprised of predominantly 2000 Ma [8,9] phyllites and interbedded greywackes metamorphosed to greenschist facies, that collectively belong to the Lower Birimian System. Southeast of the lake are basaltic lavas with minor interbedded greywackes of the Upper Birimian. Intruded within the metamorphic rocks are microgranite and dolerite dikes and a relatively large (~2 km in diameter) intrusive body called the Pepiakese Granodiorite. Within the crater are impact glasses and fall-back breccias (suevites) that formed during impact. The impact glasses within the crater yield K-Ar ages ranging from of 1.2 to 1.4 Ma [10] which are in close agreement with K-Ar ages of 1.1 to 1.3 Ma the Ivory Coast tektites [6,10,11].

In our study we have determined the $\delta^{18}O$ values of the metasediments from the Lower Birimian System, the Pepiakese intrusive rocks, and the microgranites from the Bosumtwi crater. The major and trace element concentrations of these same target rocks were presented in a previous study [4]. We also determined $\delta^{18}O$ values of 5 Ivory Coast tektites and 4 Bosumtwi impact glasses. The $\delta^{18}O$ values of the target rocks range from a low of 8.6 to 8.9‰ for the Pepiakese intrusive to a high of 11.3 to 13.6 ‰ for the metasediments and microgranites (Fig. 1). The $\delta^{18}O$ values measured here for the Bosumtwi impact glasses range from 12.6 to 14.3 ‰ (Fig. 1) and for the Ivory Coast tektites range from 11.7 to 12.9 ‰ (Fig. 1). Somewhat higher $\delta^{18}O$ values of 12.8 to 14.6 ‰ were previously reported for the Ivory Coast tektites [7].

It has been argued [4], based on major and trace element data, that the Ivory Coast tektites were derived from melting a mixture of ~75% Lower Birimian System metasediments and ~25% Pepiakese intrusive rocks. The Pepiakese intrusive was thought to be a major source material for the tektites because the intrusive has high concentrations of Ni, Cr, Ca and Mg which, when mixed with the average metasediments, yields compositions similar to the tektites [4].