MAGMA-FLUID DEGASSING AND CRUSTAL CONTAMINATION IN THE GENESIS OF MINERALIZED AFRICAN A-TYPE GRANITES

1BOWDEN, P. and 2HARRIS, C. 1Université Jean Monnet, St Etienne, France; 2UCT, Rondebosch, Cape Town, South Africa

It is suggested on the basis of dD and d18O values on mineral separates from A-type granites, that magma-fluid degassing and crustal contamination played a dominant role in mineralization at anorogenic centres in Africa. D/H and O isotopic data on mafic mineral separates (mixtures of alkali amphibole and pyroxene), and the measured O-isotope fractionation between coexisting quartz and alkali feldspar, combined with field, textural, and petrographic evidence, suggest that initial magma-degassing at 800°C triggered mineral layering in peralkaline subvolcanic magma chambers. The mafic mineralogy, precipitated during continued periodic magma-fluid degassing, changed from arfvedsonite to aegirine as water was lost from the system. This gave rise to alternate subhorizontal zones of quartz and /or mafic minerals aligned within a network matrix of alkali feldspar. D/H and O- isotope data, however, indicate that by comparison with oceanic peralkaline systems at Ascension island, continental peralkaline anorogenic granite magmas in Africa show mild degrees of crustal contamination. In contrast, metaluminous and peraluminous A-types granites show more substantial crustal contamination. dD values for trioctahedral micas (siderophyllite-trilithionite) in the niobium-tin-zinc mineralized volcanic-subvolcanic African A-type centres, suggests that greisen micas were precipitated from condensed portions of degassed magmatic-hydrothermal fluids, with the concomitant vapour phase component responsible for local metasomatic albitization. Nevertheless, the magmatic signature of the degassed hydrothermal fluid is supported by d34S (-1.4 to +3.4‰) values recorded in sphalerite, chalcopyrite, galena, pyrite and molybdenite deposited in mineralized veins and lodes. This confirms the original mantle sulphur source for sulphide mineralization found in African subvolcanic anorogenic centres.