

Biochar application in Tamil Nadu and the global food crisis

UTRA MANKASINGH¹, POON-CHUNG CHOI¹
AND VALA RAGNARSDOTTIR²

¹Dept. of Earth Sciences, Univ. of Bristol, Bristol, BS8 1RJ,
UK (*correspondence: Utra.Mankasingh@bristol.ac.uk)

²School of Engineering and Natural Sciences, Univ. of
Iceland, Reykjavik, Iceland (vala@hi.is)

The global food crisis is affecting Tamil Nadu, Southern India because of soil degradation and increased prices of fertilisers and pesticides. The plot-scale evaluation of biochar application to the agricultural soils is presented here to investigate its potential in improving soil fertility and crop yield. Biochar is an excellent soil amendment for sequestering carbon, for increasing organic carbon and water retention as well as providing habitat for microbes. Biochar also adds some macro- (P, K, N, Ca, Mg) and micronutrients (Cu, Zn, Fe, Mn) which are needed for sustainable agriculture.

Twelve soil plots, 2 m x 1 m, each with different soil amendment, were prepared in July 2009. Combinations of biochar (from rice husks and *Cassia* sp. stems) and/or compost were applied and incorporated into the soil. Okra and cluster beans crops were rotated on selected plots between July 2008 and January 2009. Soil and plants from each plot were sampled during each harvest.

Preliminary results indicate that the soils are porous with low moisture content (<1%) and low organic matter (<1%) with <0.5% soil organic carbon. However, the biochar appears to contain 40-50% carbon. Chemical nature of the soil and biochar with respect to macro- and micronutrient concentrations and mobility was also characterised, and SEM images have also been used to assess the physical structure of the soil.

Fluid-absent melting of pelites at subarc depths

U. MANN AND M.W. SCHMIDT

Institut für Mineralogie und Petrographie, ETH Zürich,
Zürich, Switzerland (ute.mann@erdw.ethz.ch)

A geochemical contribution of subducted sediments to the source region of arc magmas has been identified by the trace element characteristic of both materials. To understand this signal, we need to precisely define the melting behaviour of deeply (100-200 km) subducted metapelitic rocks. The major factor controlling melting along a given subduction geotherm is bulk composition and in particular the bulk H₂O and CO₂ contents. Due to strong devolatilisation during initial subduction, water contents at depth > 70 km will be ≤ 1.5 wt%. Such water is mainly bound in hydrous phases and at pressures of 3-8 GPa, the stability of phengite [1] will control melt production. A warmish average subduction geotherm might intersect the wet solidus, defined by the phengite + qtz breakdown in the presence of a fluid phase,, which has recently been placed between 700 and 800°C in high pressure experiments performed at 3-4 GPa [2, 3]. In hot subduction zones, the fluid absent solidus, again defined by the melting reaction of phengite, could be intersected. Moreover, the presence of a carbonate component in the subducted sedimentary pile will further shift the solidus temperature as a function of CO₂ content.

In order to identify the temperature of the fluid absent solidus, the melt productivity, and melt composition we have studied the melting behaviour of synthetic pelite compositions (CMASNKH + TiO₂) at 3-7 GPa and 800-1400°C using piston cylinder and multianvil apparatus. The CO₂ content varied from 0-4 wt%. Coarse grains (~ 200 µm) of porous quartz were added to the starting materials to act as melt traps where melt fractions are low.

First melts for CO₂-free compositions at 3 GPa were identified at 800°C with melt fractions < 7 wt%, which is remarkably close to the fluid-saturated solidus. The final breakdown of phengite occurs at T > 900°C and melt fractions at 950°C have reached ~ 30 wt%. At 6 GPa, a pressure at which the fluid-present solidus is already terminated by its second-critical endpoint, the fluid absent solidus for metapelites is located at T < 1050°C.

[1] Domanik K.J. & Holloway J.R. (1996) *Geochim. Cosmochim. Acta* **60** 4133-4150. [2] Schmidt M.W., Vielzeuf D. & Auzanneau E. (2004) *EPSL* **228** 65-84. [3] Hermann J. & Spandler C.J. (2008) *J. Petrol.* **49** 717-740.