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Standard biochar materials

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The editorial “Sifting Through the Embers”¹ is topical and nicely identifies some key needs in biochar research. The common issue of insufficient information on biochar production and characteristics to allow for replication of research or to benchmark findings of other researchers is also clearly highlighted. The development of standardised reference materials is put forward as a first step towards addressing this important matter.

The UK Biochar Research Centre (UKBRC) at the University of Edinburgh embarked on the development of standard biochar materials in 2012. The set of 12 standard biochar materials (Edinburgh Standard Biochar set) was released to the global research community in 2015 (see Figure 1). These are freely available and are the product of several years of research and development activity. The initiative and the materials have recently been described in the academic literature².



Figure 1. Edinburgh standard biochar set, including feedstock.

The Edinburgh Standard Biochar set encompasses a range of starting materials (feedstock), converted under well-controlled and reproducible process conditions. The technology used to manufacture the biochars is industrially relevant, linking their properties to practical deployment. The feedstock represent major biomass resources and have a wide geographic relevance. The biochars display high, uniform carbon stability and contrasting physical and chemical properties. The full initial characterisation of the set is available via downloadable specification sheets and records in the interactive database at www.charchive.org (also initiated by UKBRC). The biochars are stabilised in storage through immersion in N₂ and collectively the stock exceeds 1 tonne. (https://www.biochar.ac.uk/standard_materials.php).

The ready availability of the Standard Biochars has enabled potential users to use a set of materials in common with other researchers, or to include a common point of reference among a larger set relevant to their own context. Therefore, it should encourage collaborations within the

research community. Uptake of these materials has been rapid. To date this Standard Biochar has been supplied to over 80 research groups on five continents. The research undertaken spans a range of environmental and engineering applications, including soil remediation, soil improvement, water purification, catalysts and catalyst supports, microbial fuel cells, biofilm supports, fillers, and sensors. While these biochar are not necessarily in any way the “best” for any specific application, including one or several of them in a study adds value to the research of the whole field. The first publications drawing on the Standard Biochars appeared in 2017 and currently there are 15 published papers in academic journals. The added value provided to users is now quite tangible, as results from different research activities can now be cross-referenced in the peer reviewed literature. In addition, a reference biochar material was developed in parallel with the Standard Biochar set. It was produced from one of the standard biochars, for the purpose of instrument calibration. It was finely ground, homogenised and packaged under an inert atmosphere and is supplied in sealed single-use vials.

The Standard Biochars described here are supplied for research purposes at no cost (in quantities of up to 1L for each biochar type) and are therefore available to the widest possible audience. The value of the materials is in their wide use, so as adoption expands across disciplines, geography and scale, we believe they will be important to support the more refined understanding of biochar function that Prof. Sedlak seeks in his editorial.

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Author Contributions

The manuscript was written through contributions of all authors. All authors have given approval to the final version of the manuscript.

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