# BIOCHAR USE IN BUILDING MATERIALS

**Biochar is widely used in gardening as a soil improver, but there is a growing body of research into its potential for use in building materials.**

## WHY USE BIOCHAR IN BUILDING?

Buildings are typically constructed from man-made materials, in which processes, emissions and wastes are often harmful to the environment. Nearly 60% of waste in the UK comes from the construction industry. However, biochar is a 100% natural material which can improve living conditions in buildings; and can biodegrade when demolished, actually improving soil conditions. Furthermore, biochar captures and stores CO2, so buildings made with biochar have the potential to act as 'carbon sinks.'

## CARBON SINKS

A carbon sink is a natural reservoir that stores more carbon than it releases, over an indefinite period of time. The main natural carbon sinks are plants, the ocean and soil, but carbon sinks can be made artificially, for example, by capturing CO2 and storing it in the ground or ocean bed. One idea is that buildings could become carbon sinks.

## APPLICATIONS IN BUILDING

**Plaster** Biochar can be mixed with sand and clay to make plaster.

**Render** Biochar can be mixed with lime and cement plasters and used as an exterior coating.

**Concrete** Biochar may be considered as a component in concrete admixture[2].

**Bricks** Biochar lightweight bricks are currently being trialled, using cement, lime or mud as a binder.

**Insulation** Applied at a thickness of up to 20 cm, it can be a substitute for Styrofoam[3]. In Japan, charcoal bags are used as insulation in cavity spaces, such as under floors and in ceilings[4].

**Road surfaces** Biochar is demonstrating promising results in use in hot-mix asphalt (replacing carbon black and carbon fibre) with evidence of good resistance to rutting, moisture, and cracking[5]. It can also be used to purify urban road run-off[6].

Biochar has also been used to develop lightweight biochar–concrete panels and tile adhesives[7].

## HOW TO MAKE BIOCHAR CLAY-PLASTER

The Ithaka Institute, known for its expertise in biochar, has been trialling the use of biochar in plaster. The building of the Ithaka Institute in Switzerland was the first to be restored using biochar plaster. They recommend a biochar-mud mixture to the ratio 50% biochar, 30% sand and 20% clay. For the bottom and intermediate plaster layers use larger-dimensioned pieces of biochar (diameter < 25mm), and use finely ground char for the top layer. The plaster dries black with an attractive shimmer. Both spray plastering or throw-on techniques can be used.

## POSITIVE BENEFITS FOR USE IN LIVING-QUARTERS

- Zero-waste after use
- Good insulator
- Humidity regulator
- Adsorb smells and toxins
- Efficient adsorber of electromagnetic radiation (e.g. wifi)
- High chemical stability
- Low flammability
- Anti-bacterial, fungicidal
- Less dust and dust mites
- Reduction of respiratory diseases such as asthma

## SINK CITIES FOR THE FUTURE?

Whole cities could be built from biochar. Along with increasing the proportion of vegetation, cities could become carbon sinks. Biochar can be saturated with CO2 before being added into concrete mixture, thus locking the captured CO2 within buildings. Huge volumes of greenhouse gases could be captured and stored for long term[8]. And after several centuries the cities return to nature in the form of compost[9].