



Carbon>Building: Towards a New Materials Paradigm for Dwelling

The CARBON>BUILDING initiative looks to enable a diverse group of carbon enthusiasts, from both MIT and pioneering industry groups, to be able to greatly accelerate the deployment of novel forms of carbon into efficient and environmentally benign buildings. We propose establishing a dedicated Fabrication Laboratory on the MIT North campus in Middleton, MA, that permits material science experimentation through prototyping and testing to large-format CNC and 3D print all-carbon pilot buildings to **enable carbon shrouds for carbon organisms**.

THE MOTIVATION IS SIMPLE

Faced with a prospective doubling of buildings globally by 2050, at a moment when human-made mass exceeds biomass, and faced with mounting environmental stringency, to alter the base materiality of civilization: **a Carbon Age**. We currently build with billion-ton minerals and metals, which offer high mass, high energy intensity, thermally byzantine assemblies—tacitly hydrocarbon given their apocryphal use of 40% of global energy. Yet those sectors where strength-to-weight is essential have been stealthily absorbed by carbon composites as a brilliant new monocoque-ism of seamless, thin-skin elegance. Boats, planes, and wind turbine blades already demonstrate the potential of the organic legacy to attain new economies of large-scale structural envelope: **doing more with less**, (to invert Modernist credo).

Emerging morphologies of carbon, for instance the magical pyrolysis of methane that splits back to **carbon nanotube felt** and **hydrogen**, offers brilliant materiality and perfect energy—a sleight of hand reversal of eons of carbon sequestration through planetary evolution that leaves carbon inert and in solid form. Carbon foams from coal dust as pure non-combustible building substrate: They naturally absorb sound and compression and heat. Pitch-tar, fiber-rich matrices offer laser-tuned properties for 3D printing. The unique polyfunctionality of carbon offers vivid structural, thermal, and electrical aptitude to entirely surpass extant building logics, by “less-ness.”

OUR SOLUTION

MIT technoeconomic and life cycle analyses show vivid potential for these emerging forms of carbon, and other MIT initiatives such as CarbonHouse pioneer highly automated production of all-carbon buildings. By teaming up with skilled composite engineers and fabricators, with a dedicated FabLab to relentlessly invent high-efficiency CAD-CAM and FEA versatility, we see a path to radicalizing building procurement. The twin specters of sustainability and affordability of housing haunt all markets, from favelas and townships to San Francisco suburbs. The building “industry” has decreased productivity and increased cost despite computation. Overcrowding, urban blight, poverty, and slums are the inevitable slow-motion, civilizational-scale injustice that is unfolding as the social shadow of the CO₂ cloud, whose portent already hangs heavy in the air.

A carbon/hydrogen ontology holds deep promise of faster, cheaper, greener, more resilient modes of dwelling that, if rapidly witnessed and pursued to mass-production economy, will offer a benign new dignity to all people, especially the poor.

The CARBON>BUILDING hub will foment massive change through its unique gathering under one roof of all expertise necessary to reorient our vast hydrocarbon commodities from fuel to brilliant building.