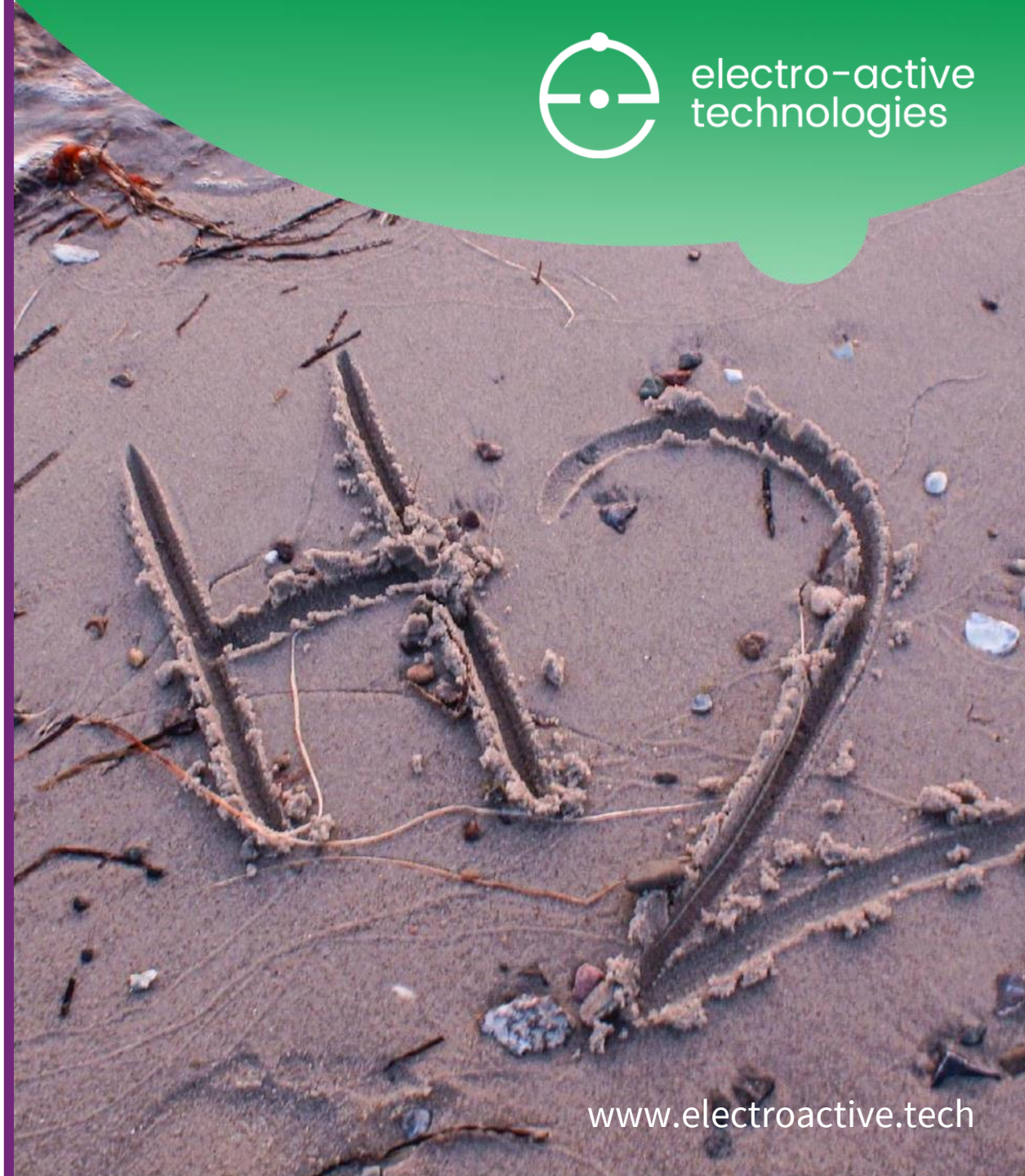
Aspire to a cleaner, brighter future

Pathways for Soil C Sequestration: Biomass and Food Waste to Fuel and Soil-Regeneration Co-products

Abhijeet P. Borole, Ph.D.
aborole@electroactive.tech

electro-active technologies



www.electroactive.tech

Biomass Pathways Investigated

electro-active technologies

OAK RIDGE National Laboratory

ENERGY.GOV
Office of
ENERGY EFFICIENCY & RENEWABLE ENERGY

CHASE Project (2013-2017): Carbon, Hydrogen and Separations Pathways

Biomass

Pyrolysis

Bio-oil

Oil phase

Biochar

Aqueous Phase

Bio-oil Hydrotreatment

Biofuels

Renewable Electricity

Microbial Electrolysis

Hydrogen

Pyrolysis : Microbial Electrolysis Cell **(PMEC) Technology**

- Switchgrass (UT Ag Institute)
- Pine wood (PNNL)
- Corn stover (NREL)
- Willow (USDA)
- Red wood (Iowa State)
- Municipal solids (ORNL)
- Algae (PNNL)
- Dairy wastewater (local dairy)

- Enzymatic/Acid Hydrolysis
- Alkaline Hydrolysis
- Thermal Pretreatment
- Hydrothermal Liquefaction
- Catalytic Pyrolysis
- Biotreatment

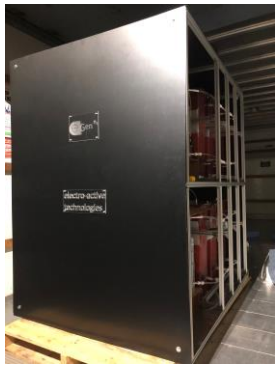
25+ peer-Reviewed publications

https://scholar.google.com/citations?user=sdr86N4AAAAJ&hl=en

Soil-Regeneration co-product

Electro-Active Process:

Commercialization of Waste to H_2 Technology



Food Waste

Pre-Treatment
S/L Separation

Liquid stream

Microbial Electrolysis

H_2

BioFuels

Co-products

Fuels

Char

Pyrolysis

Nutrient Water

N, P, micronutrients

Biomass growth
Urban Reforestration

Solid stream

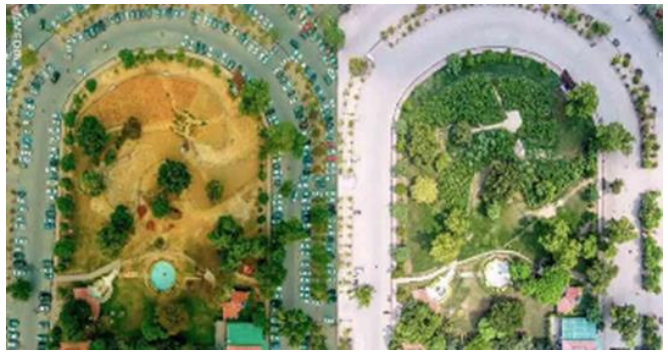
Drying Technology

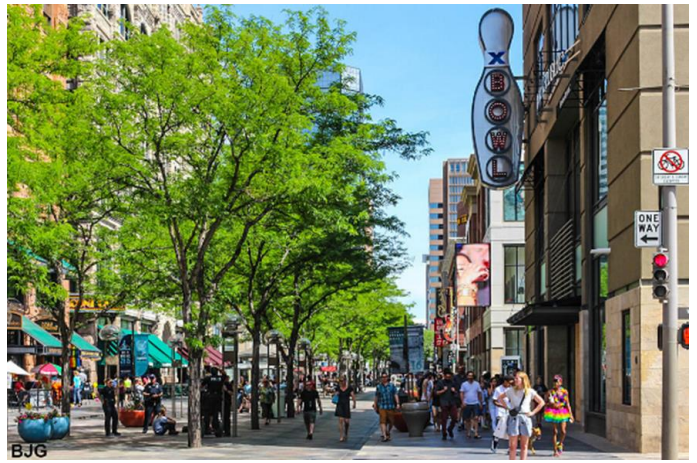
Dry solids

Composting /
Soil additive for agriculture

GHG emissions:
Carbon-negative Pathway to H_2
-82 $kgCO_2eq/kg\ H_2$

Plant growth methods





Soil Regeneration co-product

Pilot projects

- Built first food waste to H_2 pilot system
- Installed in S. Korea (Jan 2022)
- Testing initiated
- Second pilot in Knoxville
- Objectives
  1. Reducing cost of H_2 production to < $2.50/kg by 2025 (HCTO funded $1 M)
  2. Return nutrients and carbon from food waste to soil
  3. Enhance microbiome and rhizosphere growth and root development
  4. Quantify below-ground carbon sequestration

Seeking opportunities for utilizing the co-products for soil replenishment and carbon sequestration.