NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE | Nanyang Environment and Water Research Institute

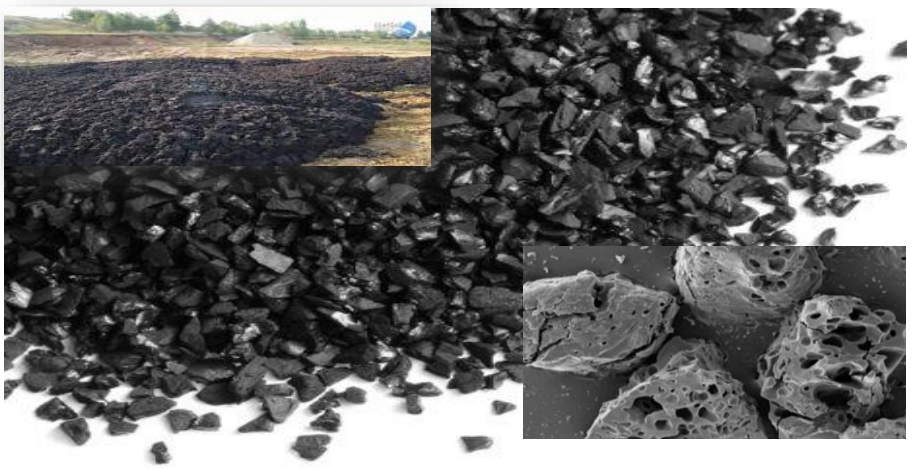
NEWRI INNOVATION

BLACK GOLD: PYROLYTIC CARBON FROM SLUDGE

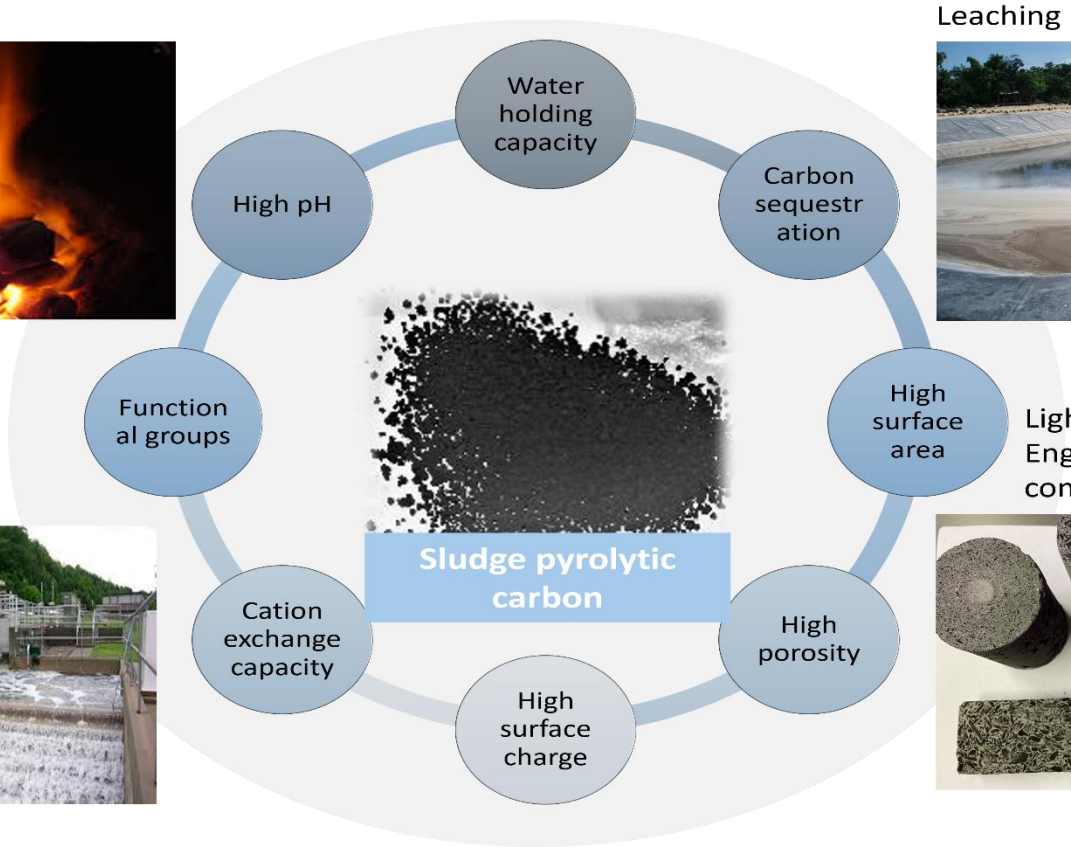
Zhou Yan (Professor); Lu Dan (Ph.D)

Sludge biochar can serve as a sustainable feedstock for production of various value-added materials. This field has not been studied in Singapore, primarily due to the differences in sludge characteristics and biochar application standards. In this project, sludge biochar will be used as a feedstock for the following purposes

1) Activated carbon for odor control and H_2S removal,
2) Additive to facilitate safe placement of incinerator bottom ash (IBA),
3) Lightweight concrete (LWC) and engineered cementitious composites (ECC) with enhanced workability,
4) Fuel supplement for gasification plants to replace imported charcoal.



Fuel supplement



Leaching heavy metals removal

Odor control

Lightweight concrete & Engineered cementitious composites

Deliverables

1) Pyrolytic carbon-based activated carbon (PCAC) for odor control: removal capacity 30-40 mg H_2S/g PCAC.
2) PCAC to adsorb leaching HMs from IBA: > 90% removal
3) Sludge pyrolytic carbon to produce suitable LWC/ECC: density of LWC/ECC around 1700 to 2000 kg/m^3
4) Sludge pyrolytic carbon as fuel supplement: LHV > 2000 Kcal/kg

Benefits

- ✓ Reduce cost for odor control, with savings of 6.3 SGD per kg of H_2S removed
- ✓ Solve the common HMs leaching problem from landfill IBA
- ✓ Ready Mix Concrete can be replaced with produced LWC/ECC economically
- ✓ Lower cost for MSW incineration, with savings of 100 SGD per ton of MSW treated

Presented by

Biotechnology and Bioprocesses
Nanyang Environment and Water Research Institute