



Moisture loss resistivity against evaporation (water retention capacity) of natural soil amended with raw and apatite synthesized fly ash

• Shenglei LIN¹, Mengzhu SONG¹, Hidetoshi KURAMOCHI², Fumitake TAKAHASHI¹

¹ School of Environment and Society, Tokyo Institute of Technology

² Center for Material Cycles and Waste Management Research, National Institute for Environmental Studies (NIES)

No. 122

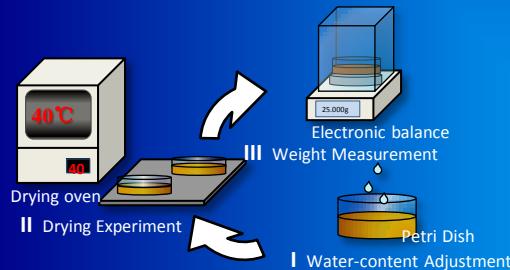
Background

- Thermal power generation is popular all over the world and large amount of coal fly ash (FA) are discharged
(Problem ①: How to utilize FA efficiently?)
- Desertification has threatened arid area like western China.
(Problem ②: Efficient soil water holding agent)

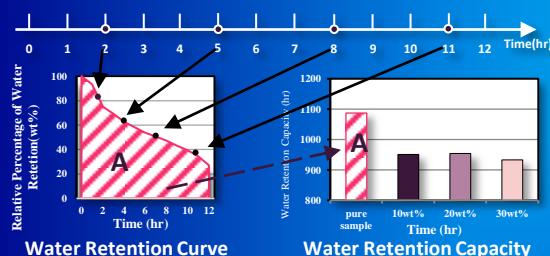
POINT

Utilize FA as the soil water holding agent

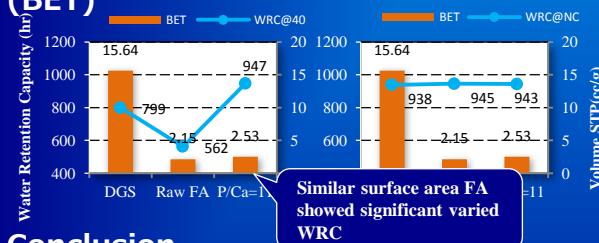
Materials & Methods



Water Retention Capacity (WRC)



Specific Surface Area (BET)



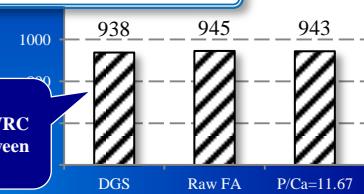
Conclusion

- Raw FA gave negative effect on adjusting WRC of soil regardless of mixing ratio;
- Apatite synthesized FA with P/Ca ratio of 11.67 gave positive effect on increasing WRC of DGS;
- Effect of FA amendment on soil WRC depends on temperature, FA mixing ratio, and surface treatment type interactively;
- No clear correlation between pore type, surface area and WRC were found at present;

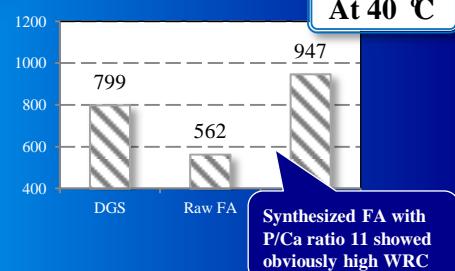
Results & Discussion

WRC of pure FA/apatite synthesized FA

At Natural Condition

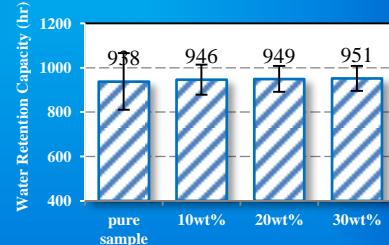


At 40 °C

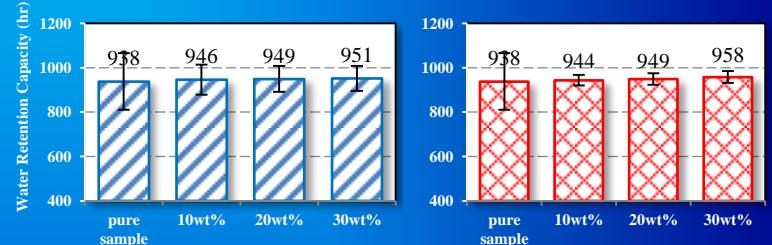


WRC of DGS amended by raw/synthesized FA

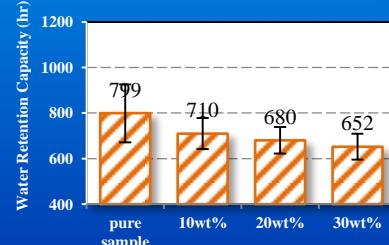
DGS + Raw FA natural condition



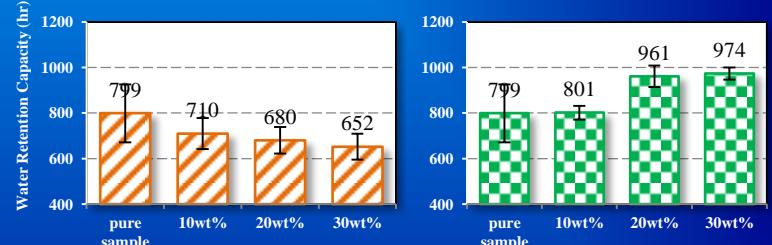
DGS + P/Ca 11.67 natural condition



DGS + Raw FA 40 °C



DGS + P/Ca 11.67 40 °C



Summary Table

| Fly Ash | WHC of FA (40 °C) | Room Temperature | 40 °C | Surface area (cc/g) | Pore Type |
|---------------------------------------|-------------------|------------------|---------|---------------------|-----------|
| | | | DGS | | |
| Raw FA | 476 | 942 | 18.4% ↓ | 2.15 | Silt |
| Apatite synthesized FA with P/Ca = 11 | 947 ↑ | 943 | 21.9% ↑ | 2.53 | Silt |