How biochar can save the world…

Isobel Stout – PDP

Kei ō tātou Ringaringa te anamata
The future is in our hands
27–30 MAY 2024
CLAUDELANDS, HAMILTON

New ideas pass through three periods:

1) It can't be done.

2) It probably can be done, but it's not worth doing

3) I knew it was a good idea all along!

Arthur C Clarke

A body of knowledge that has been accumulated over time and develops and grows in response to our changing world.

pdp

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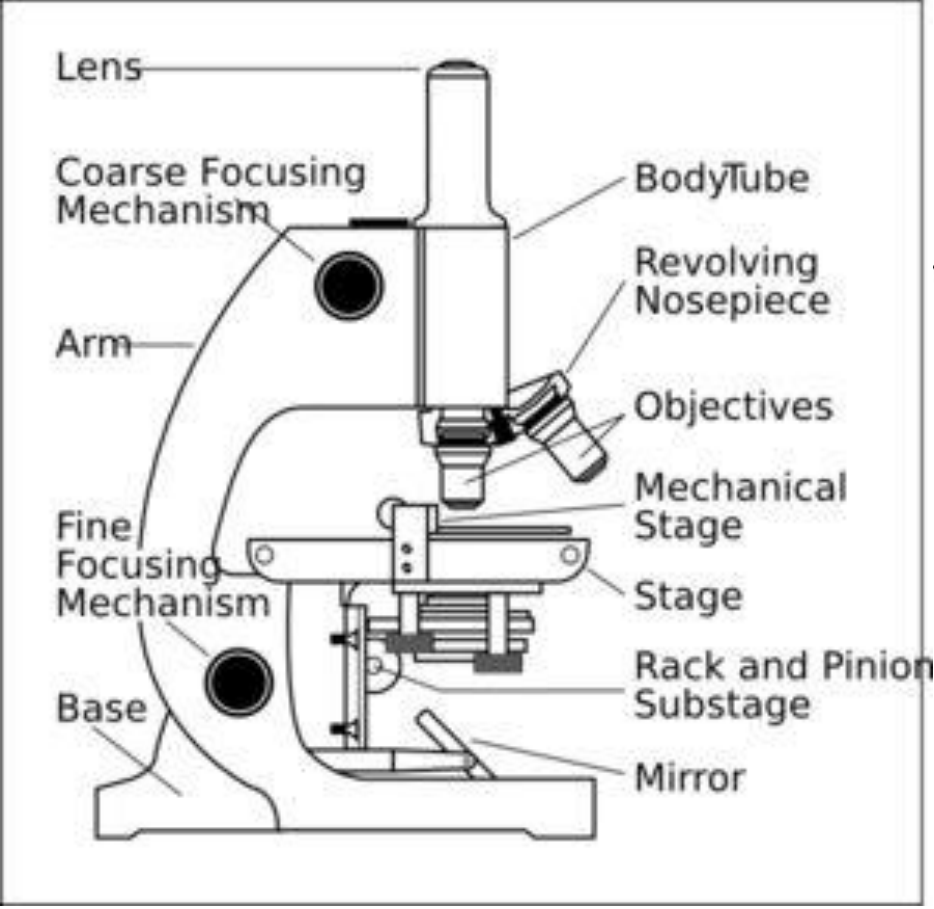
Mātauranga Māori

- Taking a genuinely holistic approach, observing, listening, building on what has gone before.

- Practices of tapu and noa support natural processes that resolve environmental damage.



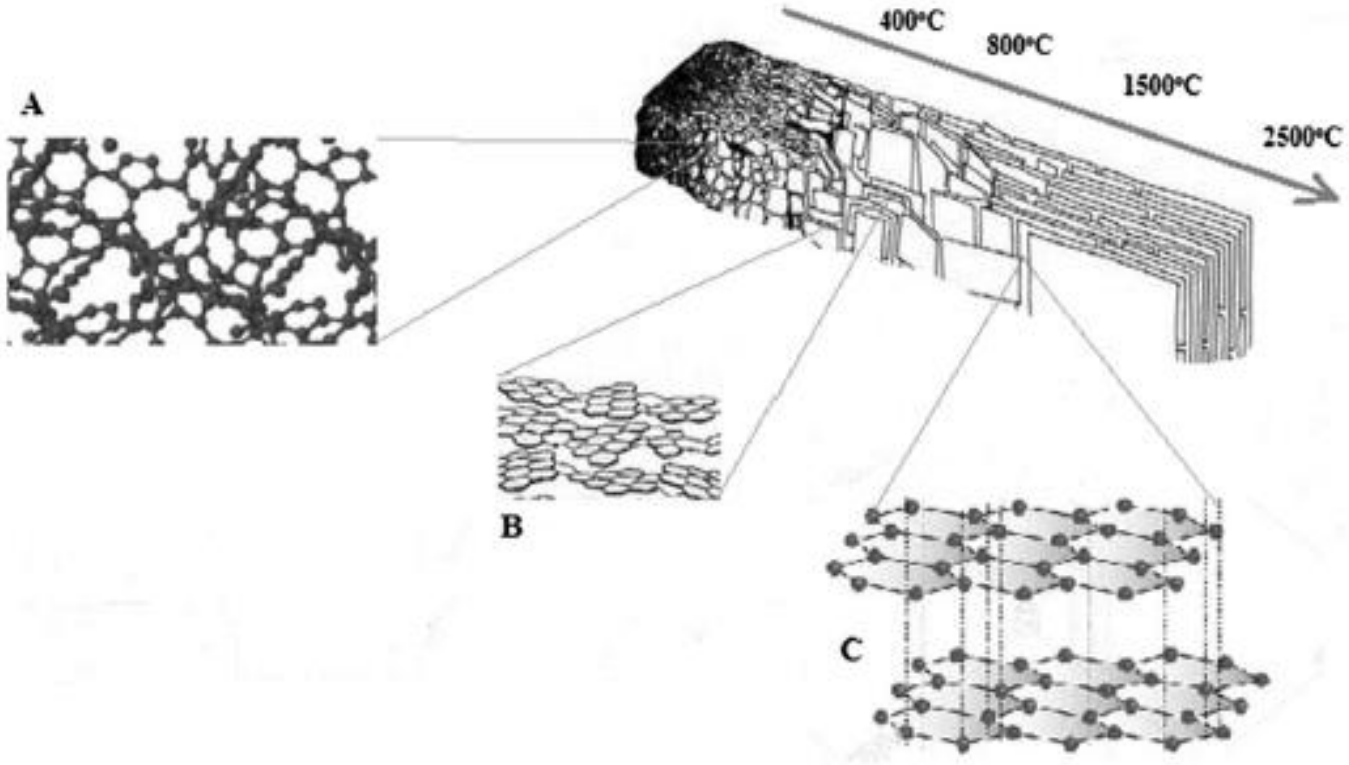


Fig. 3 Pyrolysis temperature effect on biochar: a amorphous carbon; b turbostratic carbon; c graphite carbon

What is biochar?

The product of pyrolysis of biomass (carbon rich matter)

- pine tree slash
- vine prunings
- biosolids
- animal manure
- rice husks
- straw
- sawdust
- nut shells
- wood waste
- garden waste

even plastic waste…

- Huge surface area
- Reactive surface area
- Carbon storage
- Holds water
- Stable
- ‘Natural’

- The physical makeup of biochar with many micro or nano pores – huge surface area
- The pores can house microbes that can ‘eat’ pollutant molecules
- The surface holds functional chemical groups and their range and type can be manipulated
- The source of biomass and the method of pyrolysis affects the efficiency of all three factors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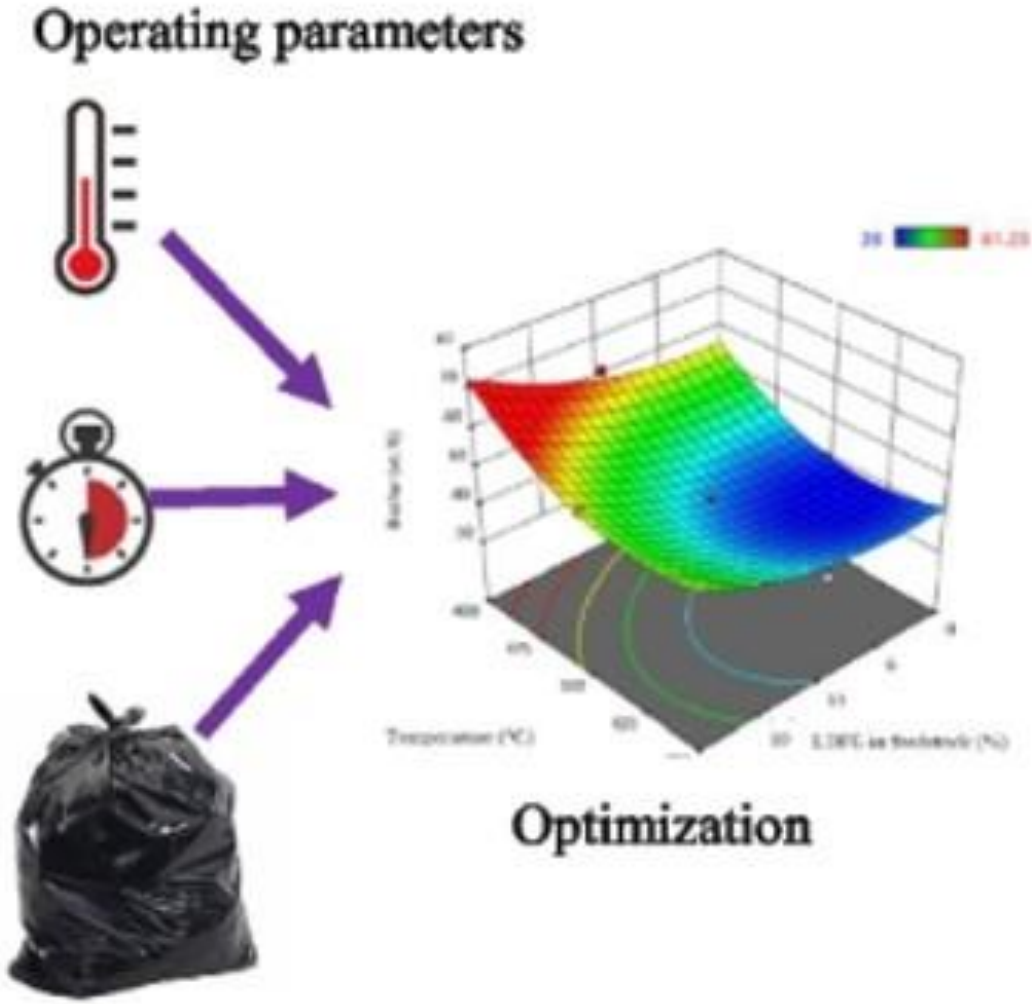

Operating parameters
Optimization

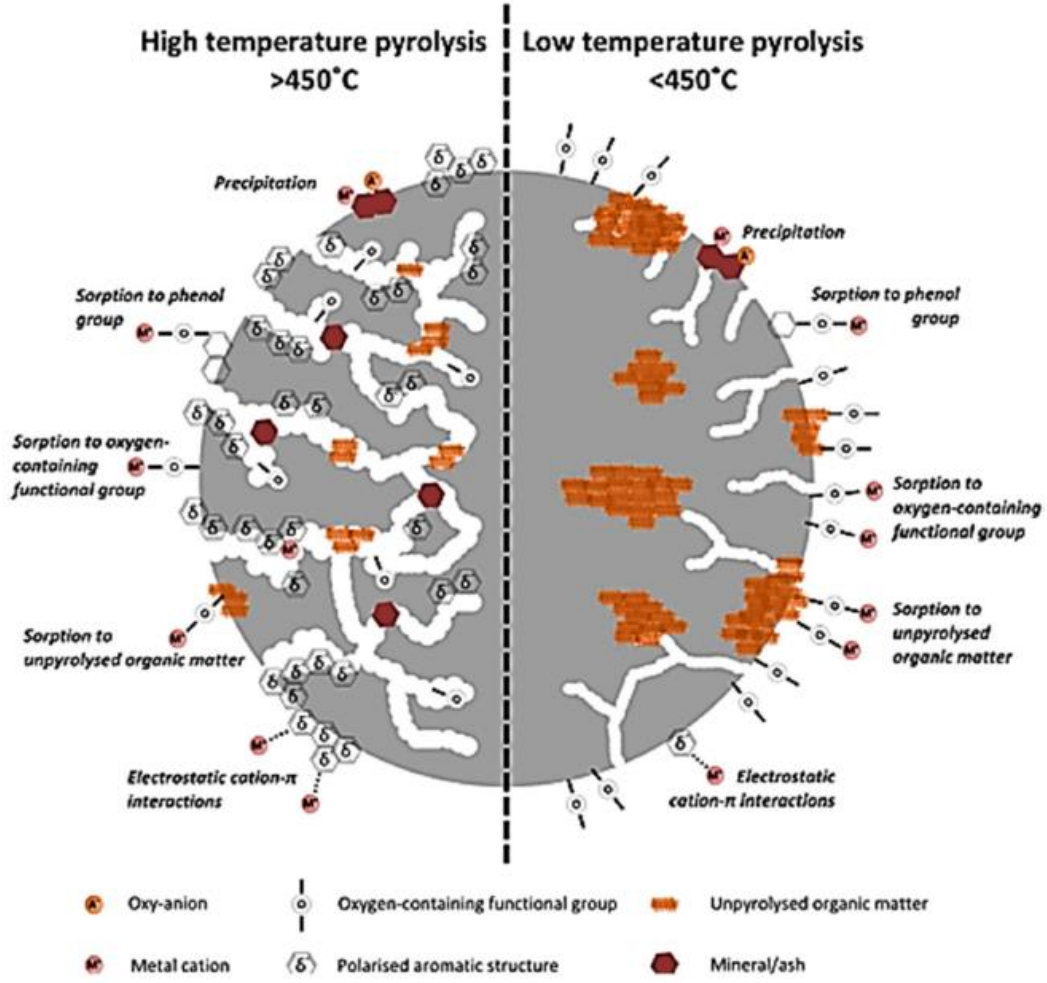
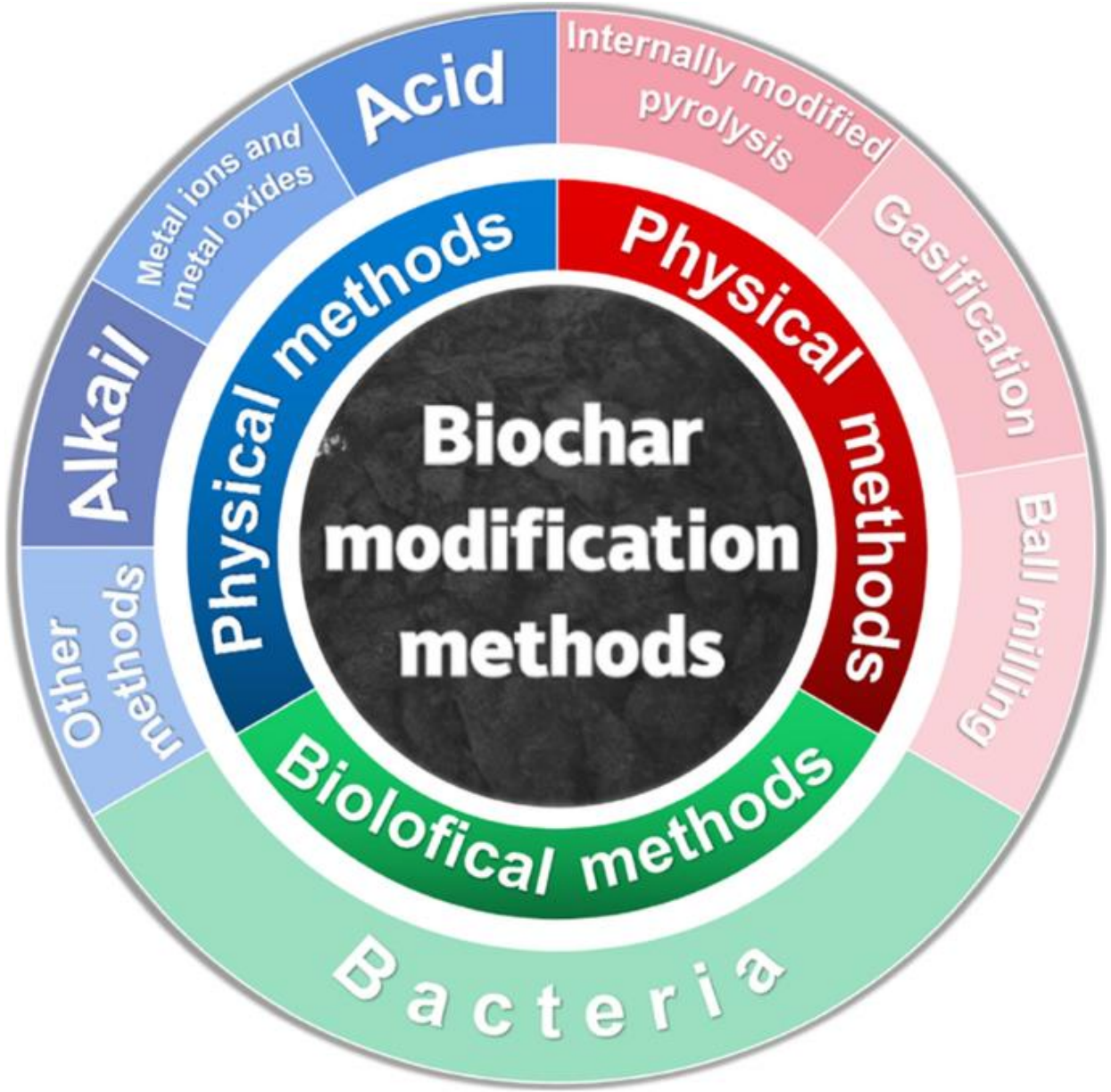
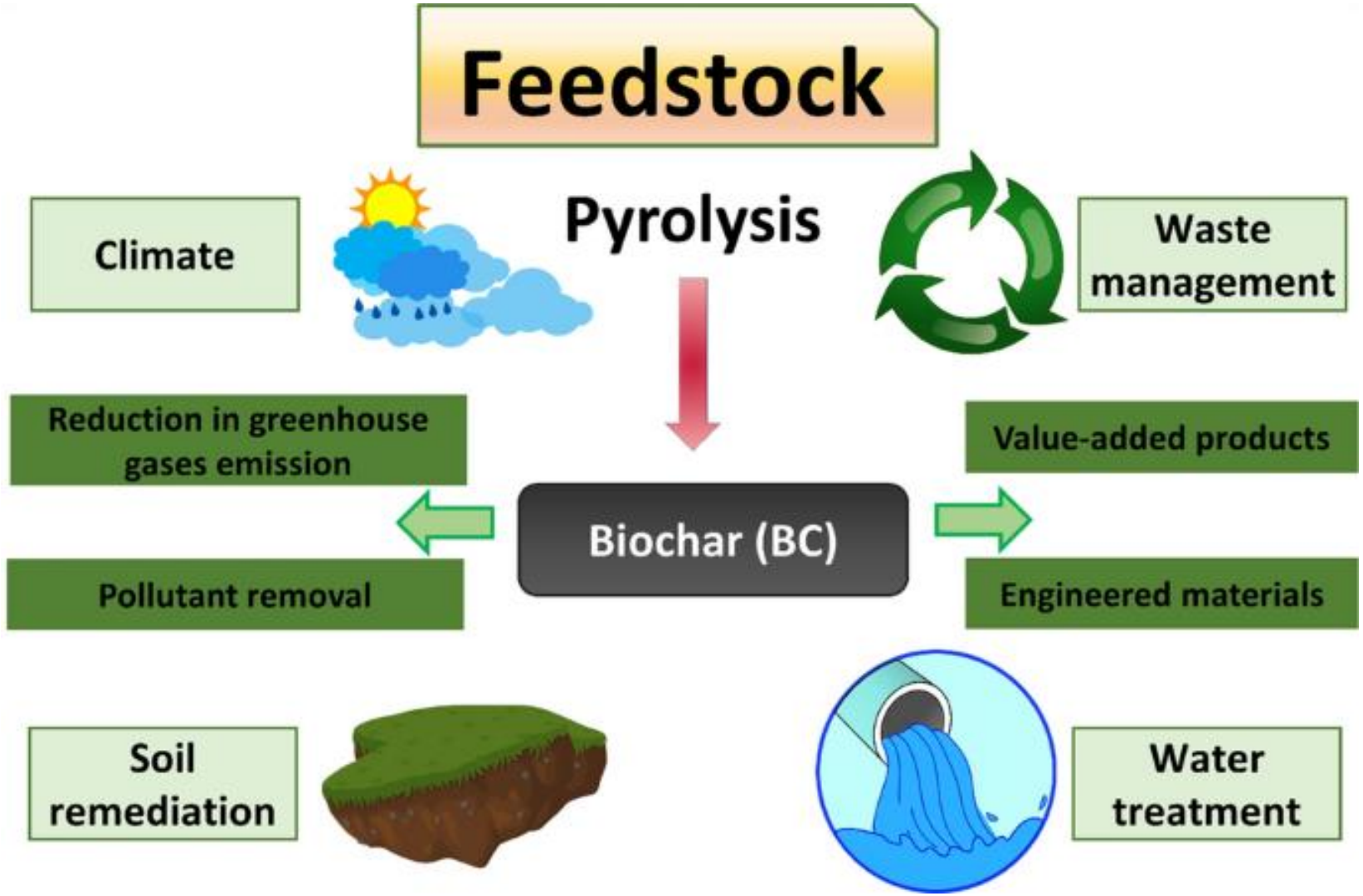
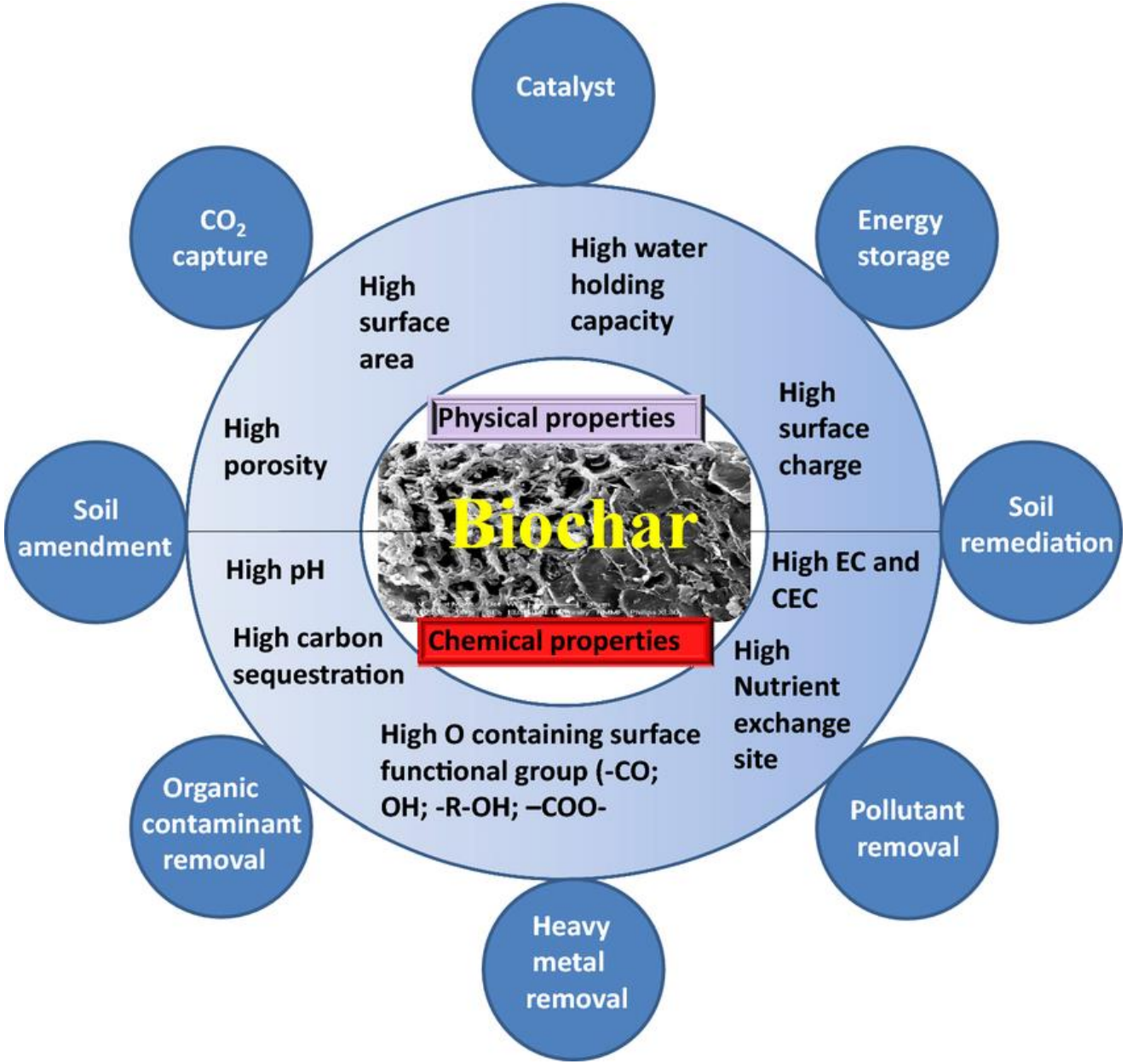


Fig. 2 Mechanisms of metal cations (e.g. Cd^{2+}, Cu^{2+}, Hg^{2+}, Pb^{2+}, Zn^{2+}) and oxyanions (e.g. PO_4^{3-}, AsO_4^{3-}) sorption to biochar prepared by pyrolysis at high temperature (> 450 °C) and low temperature (< 450 °C) (Reproduced with permission from Sizmur et al. (2017), Bioresource Technology 246 (2017) 34–47)


Biochar modification methods
Physical methods
Physical methods
Biolofical methods
Acid
Alkail
Metal ions and metal oxides
Other methods
Internally modified pyrolysis
Gasification
Ball milling
Bacteria


Feedstock
Pyrolysis
Climate
Waste management
Reduction in greenhouse gases emission
Value-added products
Biochar (BC)
Pollutant removal
Engineered materials
Soil remediation
Water treatment


Catalyst
CO_2 capture
Energy storage
High surface area
High water holding capacity
High porosity
Physical properties
High surface charge
Soil amendment
Biochar
Soil remediation
High pH
High EC and CEC
High carbon sequestration
Chemical properties
High Nutrient exchange site
High O containing surface functional group (-CO; OH; -R-OH; –COO-
Organic contaminant removal
Pollutant removal
Heavy metal removal

Nurture
the seed and
it will bloom

Poipoia te kākano kia puāwai