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Synthesis and carbonation of mesoporous magnesium oxide

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Context

- ✓ Carbon capture and storage = key point to combat climate change
- ✓ One way of CO₂ capture = use of oxide as sorbents : CaO, MgO, Li₂ZrO₃, CaZrO₃,...
- ✓ CaO and MgO = most attractive since carbonate are stable in storage condition and oxides are low-cost materials.
- ✓ CaO presents some drawbacks such as its loss of carbonation capacity along cycling

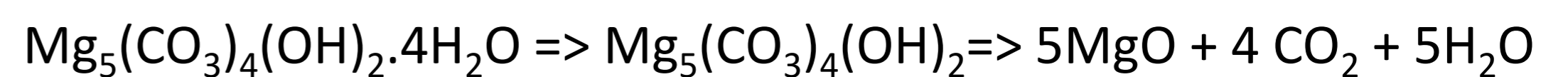
➡ Interest to study MgO as a CO₂ sorbent :



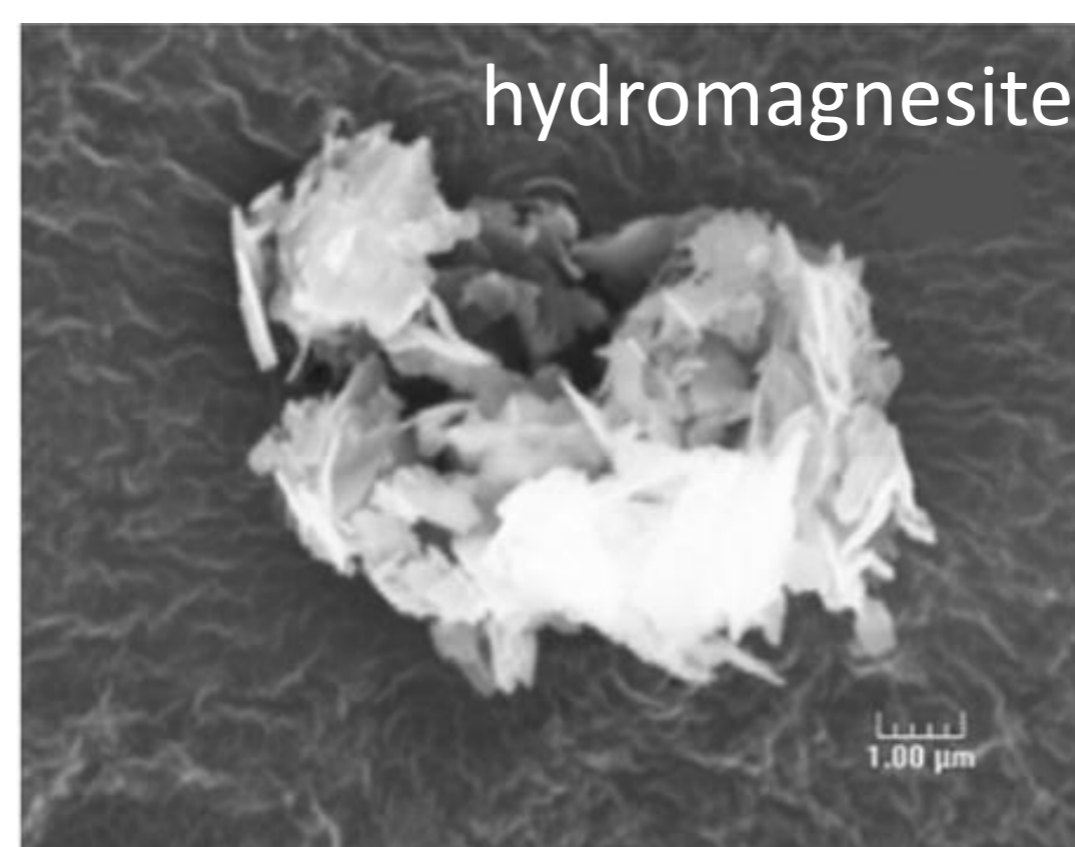
- ✓ Few study at atmospheric pressure

Synthesis and characterization of MgO

Thermal decomposition of hydromagnesite
3h at 300°C then 3h at 600°C under Ar



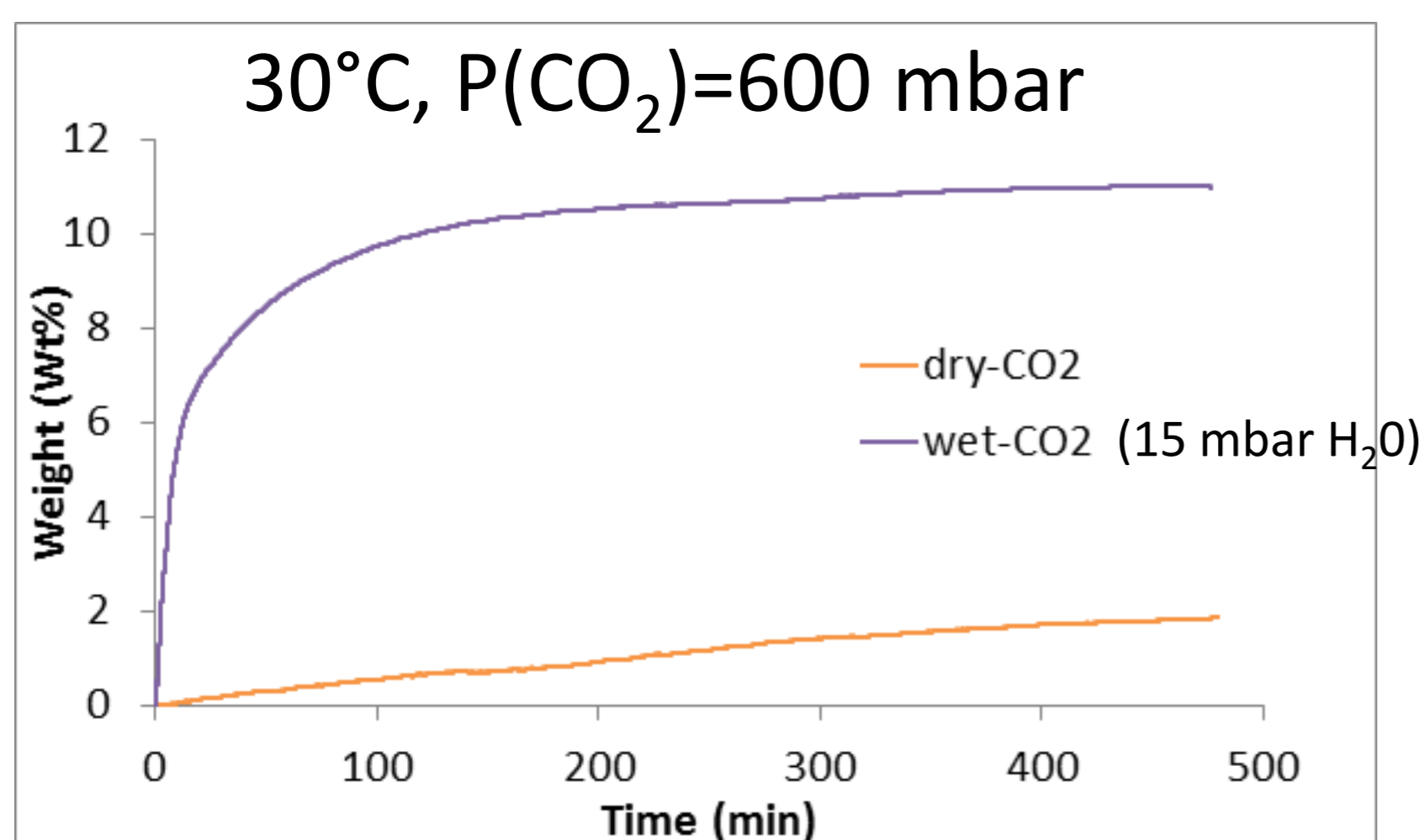
Sample	BET surface area /m ² .g ⁻¹	Pore volume /cm ³ .g ⁻¹
MgO (from hydromagnesite decomposition)	100	0.35
Hydromagnesite	23	0.068
Commercial MgO	9	0.048



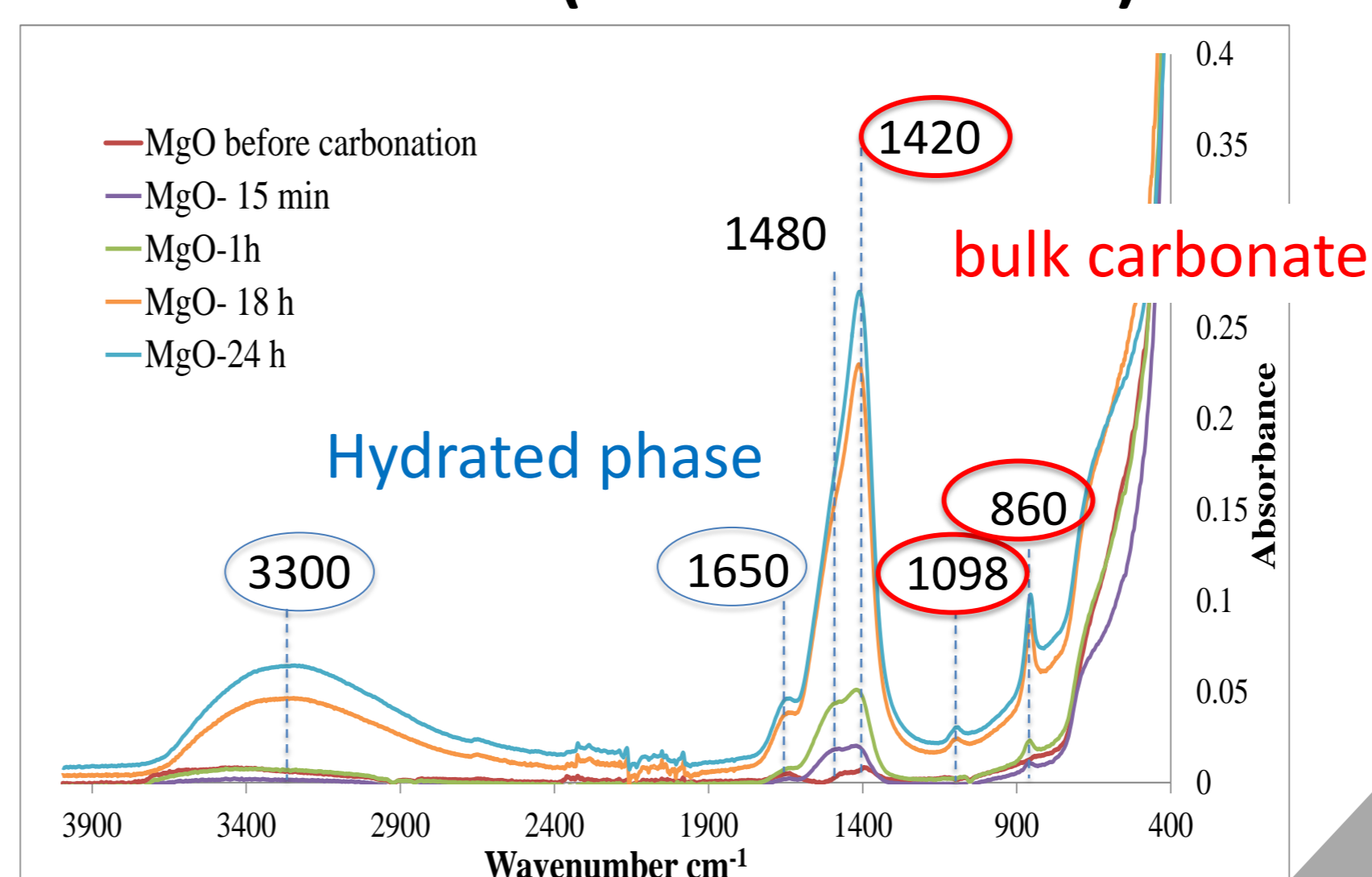
Carbonation of mesoporous MgO

30°C, P(CO₂)=500mbar, P(H₂O)=15mbar

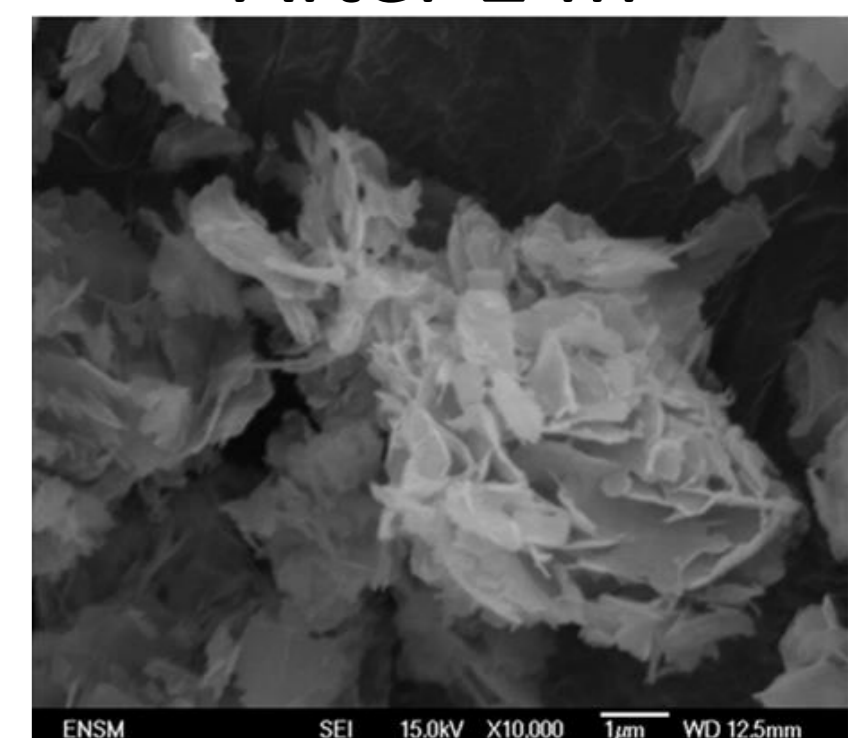
ATG (Mettler-Toledo AG/DSC 1)



FTIR – ATR (Bruker Vertex 70)



After 24h



S_{BET} = 10 m².g⁻¹

- ✓ Need for water vapor to carbonate
- ✓ Formation of MgCO₃.3H₂O at low temperature (30°C)
- ✓ Grain shape seems preserved
- ✓ Specific surface area decreases with carbonation

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