

Solidia Cement[®], a new low carbon binder

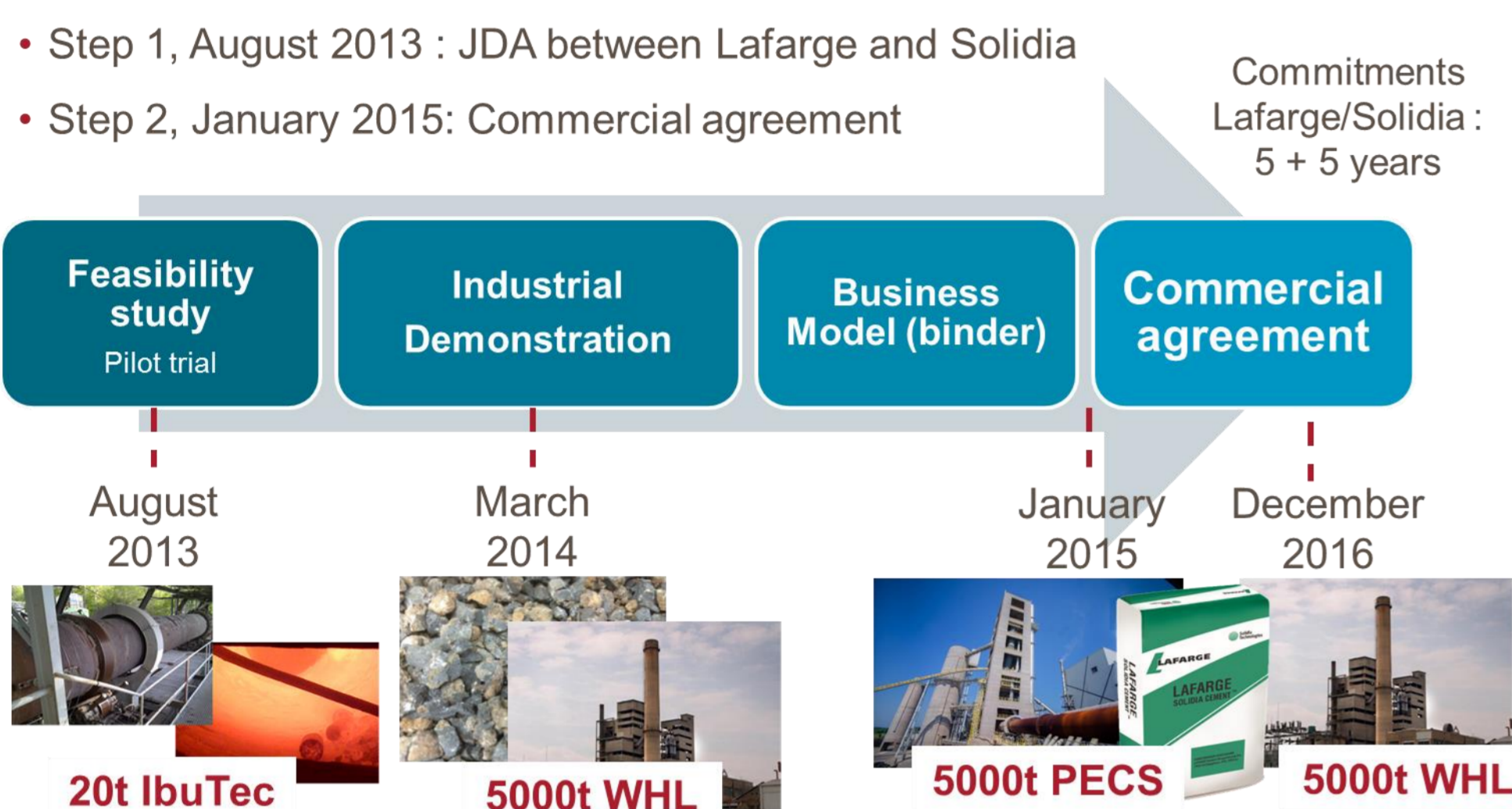
Solidia Technologies[™]: Start-up company in US, founded in 2008

Raised a total of 80 M\$ from investors (Kleiner Perkins Caufield & Byers, Bright Capital, BASF Venture Capital, BP Ventures, LafargeHolcim, Total, Air liquide)

A new binder dedicated to precast industry

A calcium-silicate cement based on mineral carbonation and offering 50 – 70% CO₂ savings compared to OPC

Partnership LafargeHolcim / Solidia



Technical solution: cement & concrete

- Same Raw Materials
- Same Kiln
- Same Mix Components
- Same Mixer
- Same Cycle Time
- Same Forming Casting
- Same Cycle Time
- CO₂-Curing
- Reduced Curing Times
- 28 Day < 1 Day

Solidia Cement[™]
CO₂ emissions at cement plant reduced by 250 kg (per ton of clinker)

Solidia Concrete[™]
Up to 300 kg of CO₂ permanently stored in concrete (per tonne of cement used)

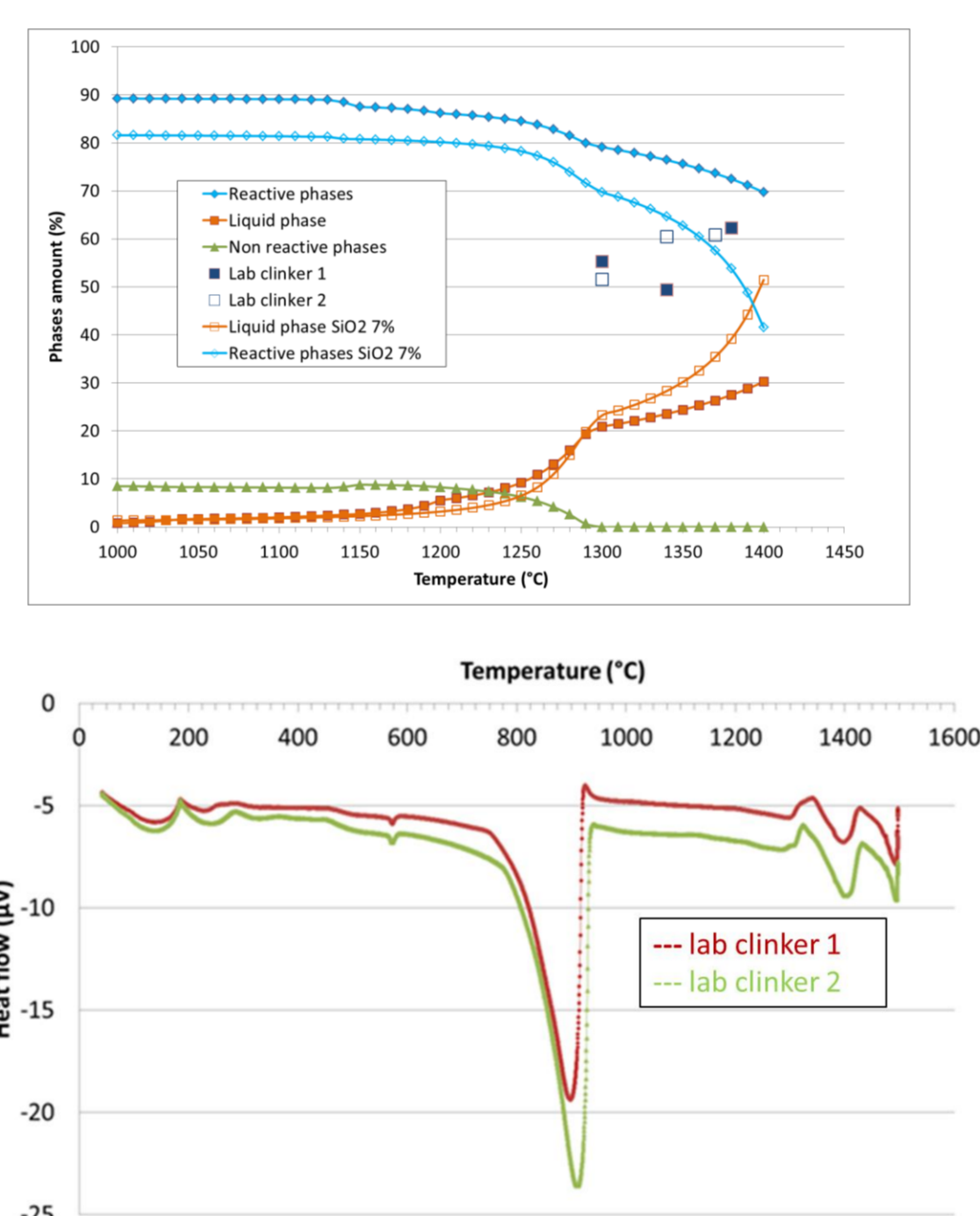
A 30% CO₂ emissions reduction solution for LafargeHolcim

Solidia clinker mineralogy & thermodynamic simulations

- No Hydration → Carbonation → Carbonatable phases targeted
- XRD Rietveld phases quantification

Wollastonite, CS (CaSiO ₃)	Reactive phases 40 to 60%
Rankinite, C ₃ S ₂ (Ca ₃ Si ₂ O ₇)	
Belite, C ₂ S (Ca ₂ SiO ₄)	Semi reactive phases
Melilite (Ca ₄ Al ₂ MgSi ₃ O ₁₄), Akermanite (Ca ₄ Mg ₂ Si ₄ O ₁₄), Gehlenite (Ca ₄ Al ₄ Si ₂ O ₁₄)	
Amorphous	

- Thermodynamic simulations: a good quality indicator
- HT DSC, a good lab indicator for industrial productivity



Cement production in Whitehall plant (USA)

- Raw materials used available in the quarry:
- Quarry rock: limestone containing some silica and minor elements (Al₂O₃, Fe₂O₃, MgO, SO₃)
- Sand: mainly SiO₂
- Fuels used: Petcoke / Coal / Plastics
- 4 stages preheater kiln

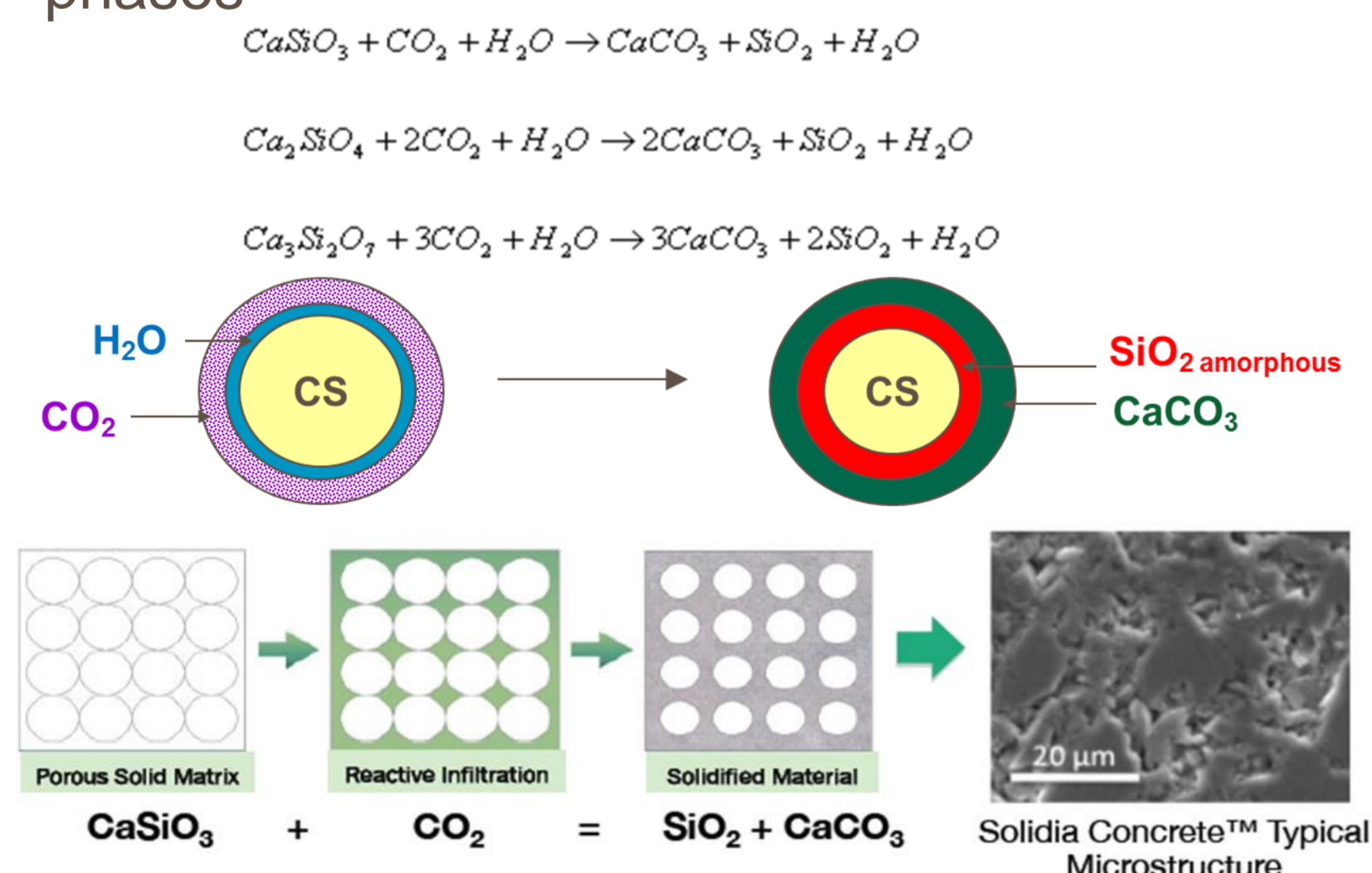
Period	PC clinker	Solidia clinker
Specific heat consumption (SHC)	Normal production 3.89	Stable production period 3.16
Stack CO ₂	24.4 %	14.2 %
CO ₂ emissions	Nm ³ /t ck 474	334

- Raw mix containing less calcite
- Lower clinkering temperatures (1250 – 1350°C)
→ 30% CO₂ emissions reduction verified

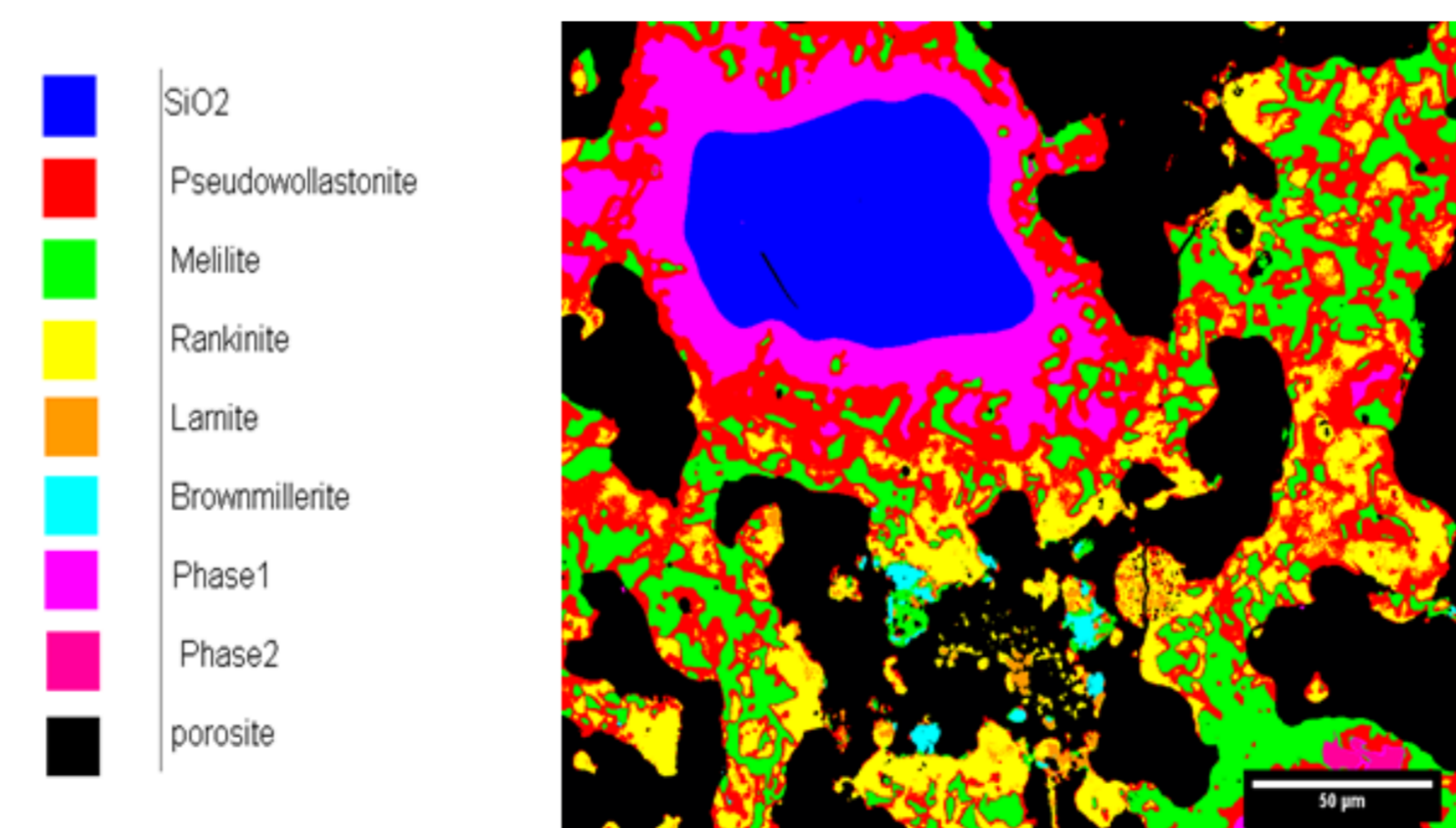
Additional 30 to 40% CO₂ emissions reduction at precasters site

Mineral carbonation

- Carbonation reaction with clinker reactive phases



From clinker phases...



to ...

carbonated cement

CS = CaSiO₃
Si = Silica
Ca = CaCO₃



Two applications examples



Concrete Product	Mass Gain (CO ₂ uptake), %	CO ₂ Sequestered/t of Cement	CO ₂ Savings/t of Cement	Total CO ₂ Savings/t of Cement	Total CO ₂ Savings, % (vs. 810kg for OPC)
Solidia Paver	3.4	236 kg	245 kg	481 kg	59.4
Solidia Hollow Core	3.3	220 kg	245 kg	465 kg	57.4

CO₂ captured in the concrete

CO₂ saved during clinker production



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www.solidlife.eu

