



Al-B-C ternary compounds : synthesis, structure, composition and thermal stability

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AI-B-C ternary compounds : synthesis, structure, composition and thermal stability

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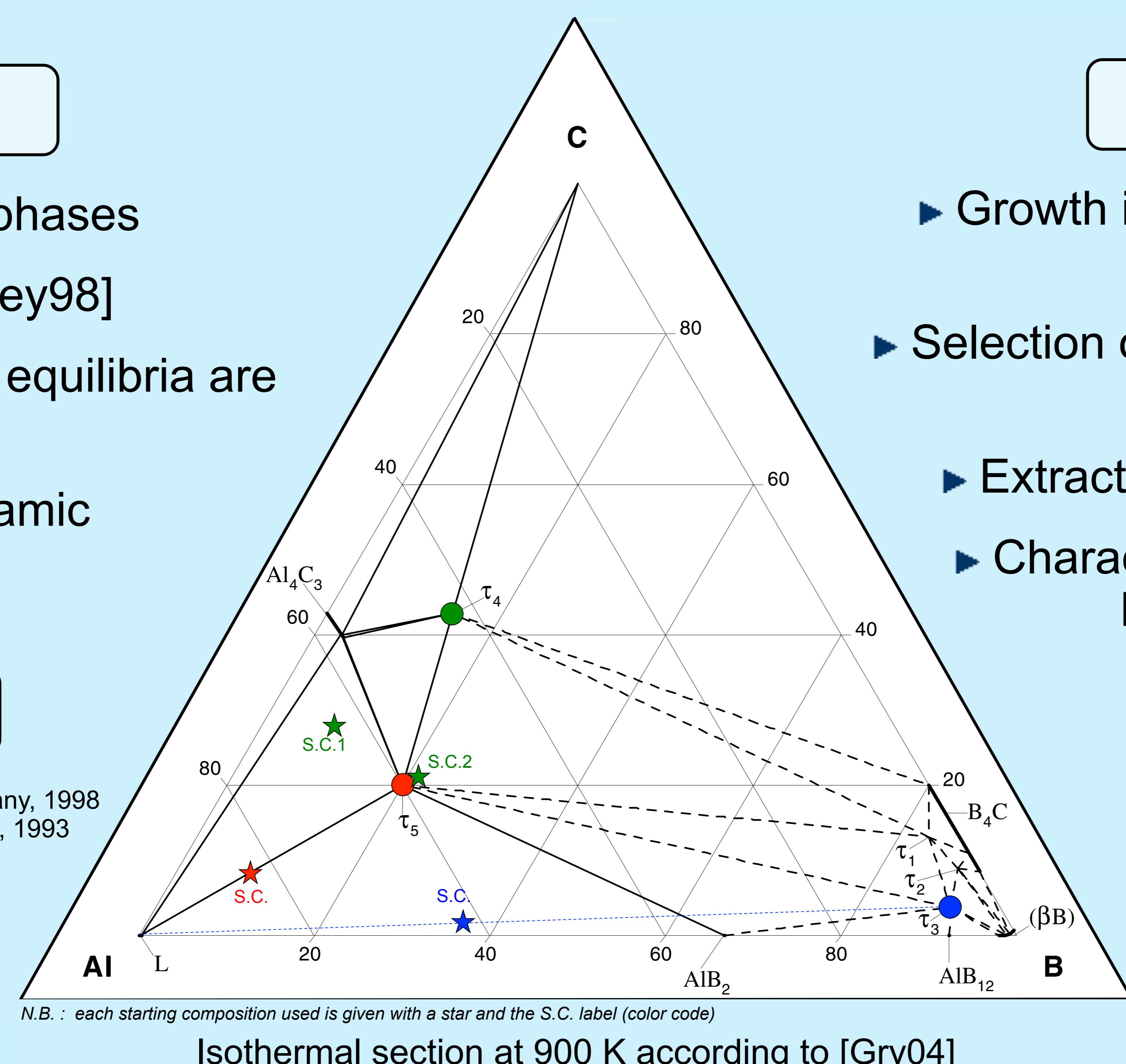
The AI-B-C system

- 5 stoichiometric ternary phases
- Structures are known [Mey98]
- High temperature phase equilibria are mostly **unknown**
- **No complete thermodynamic assessment** [Wen93]

Synthesis of phases

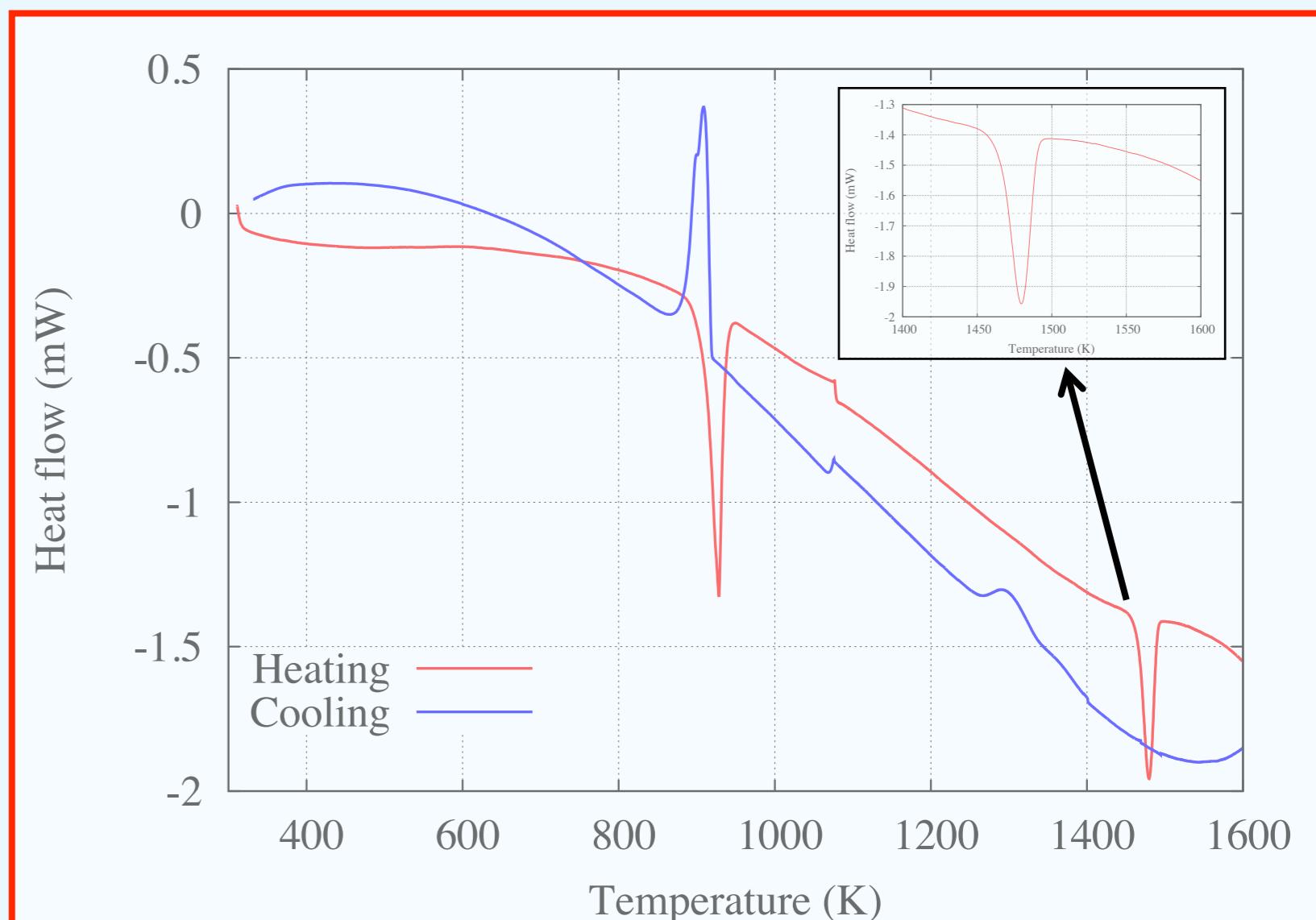
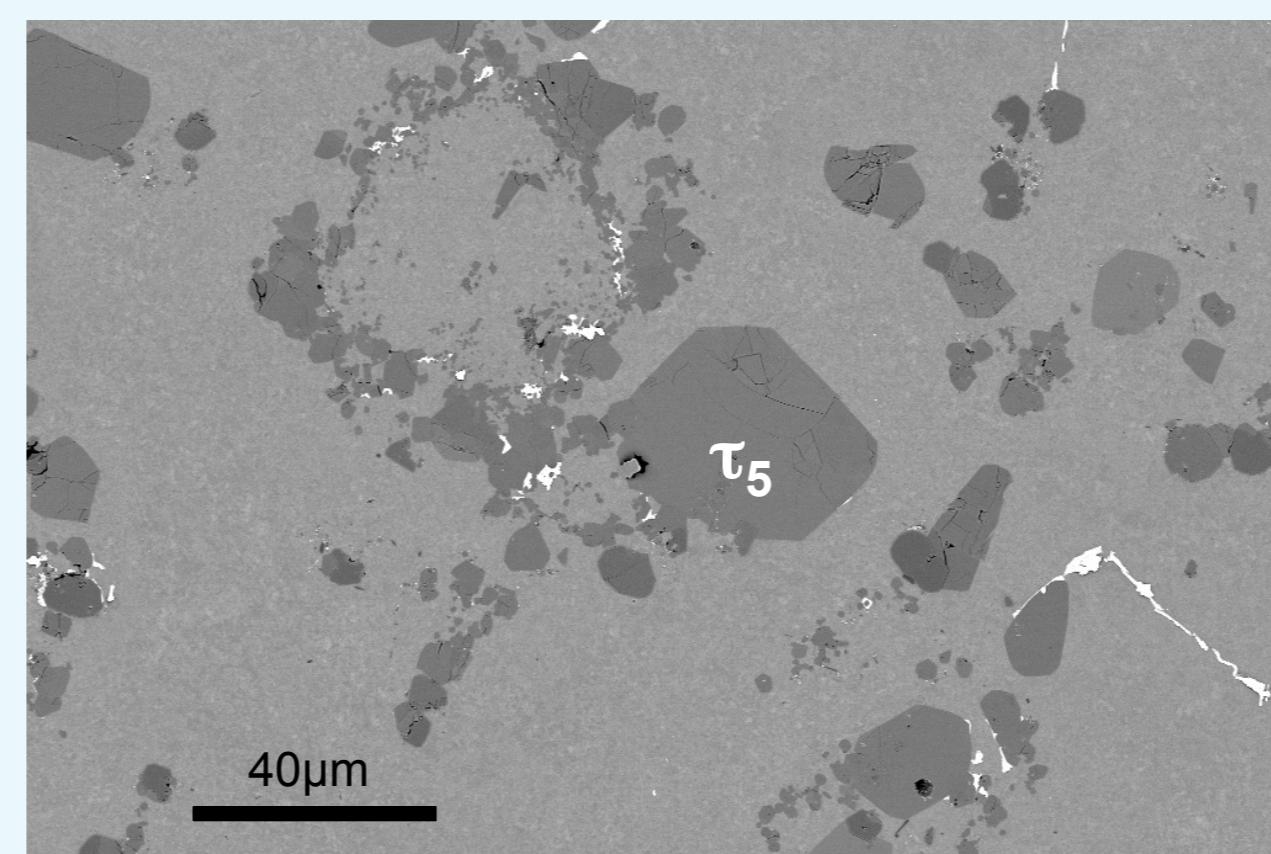
- Growth in Al melt between 1273 and 1800 K
- Selection of compositions in dedicated triangles
- Extraction by selective acid etching
- Characterization of crystals : DRX, Raman, EDX, DTA, DSC-Cp

References



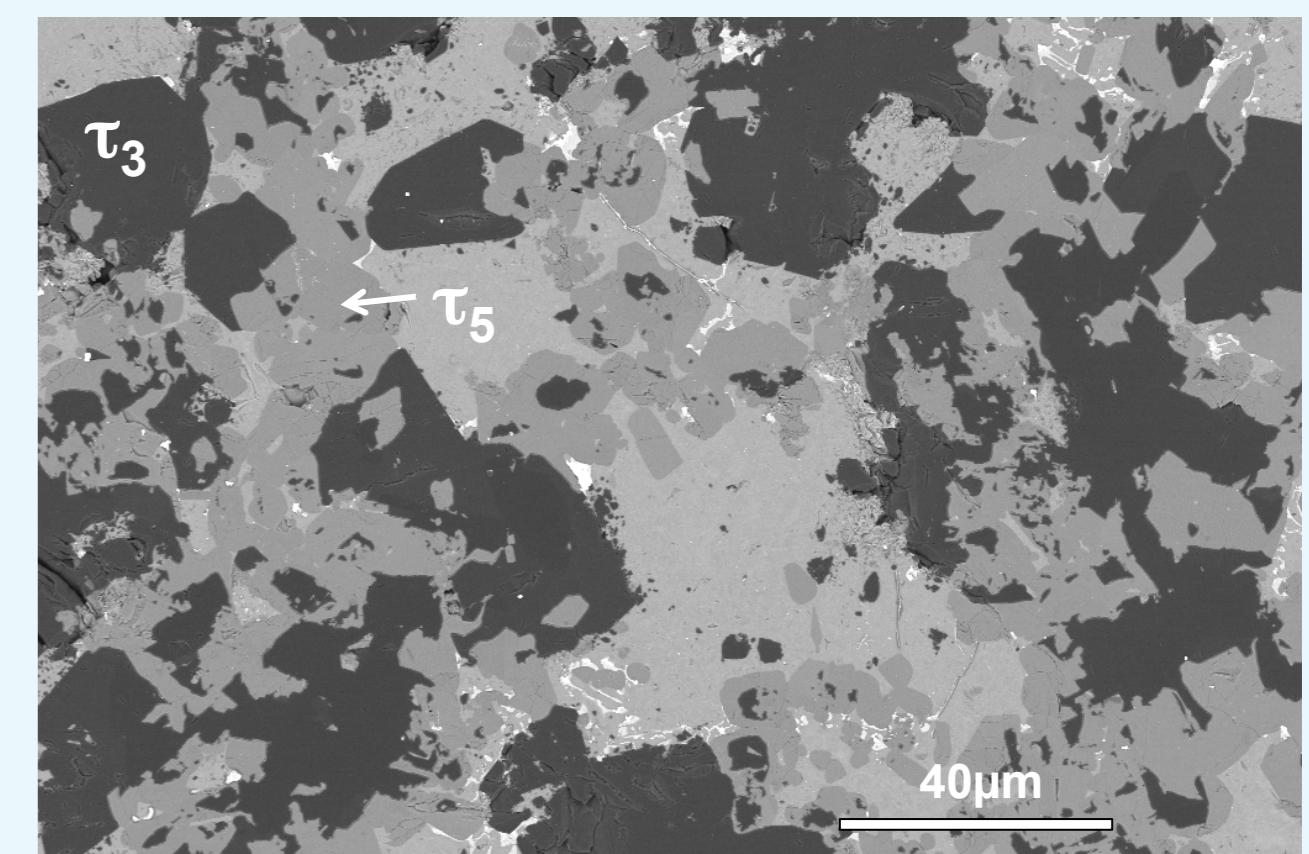
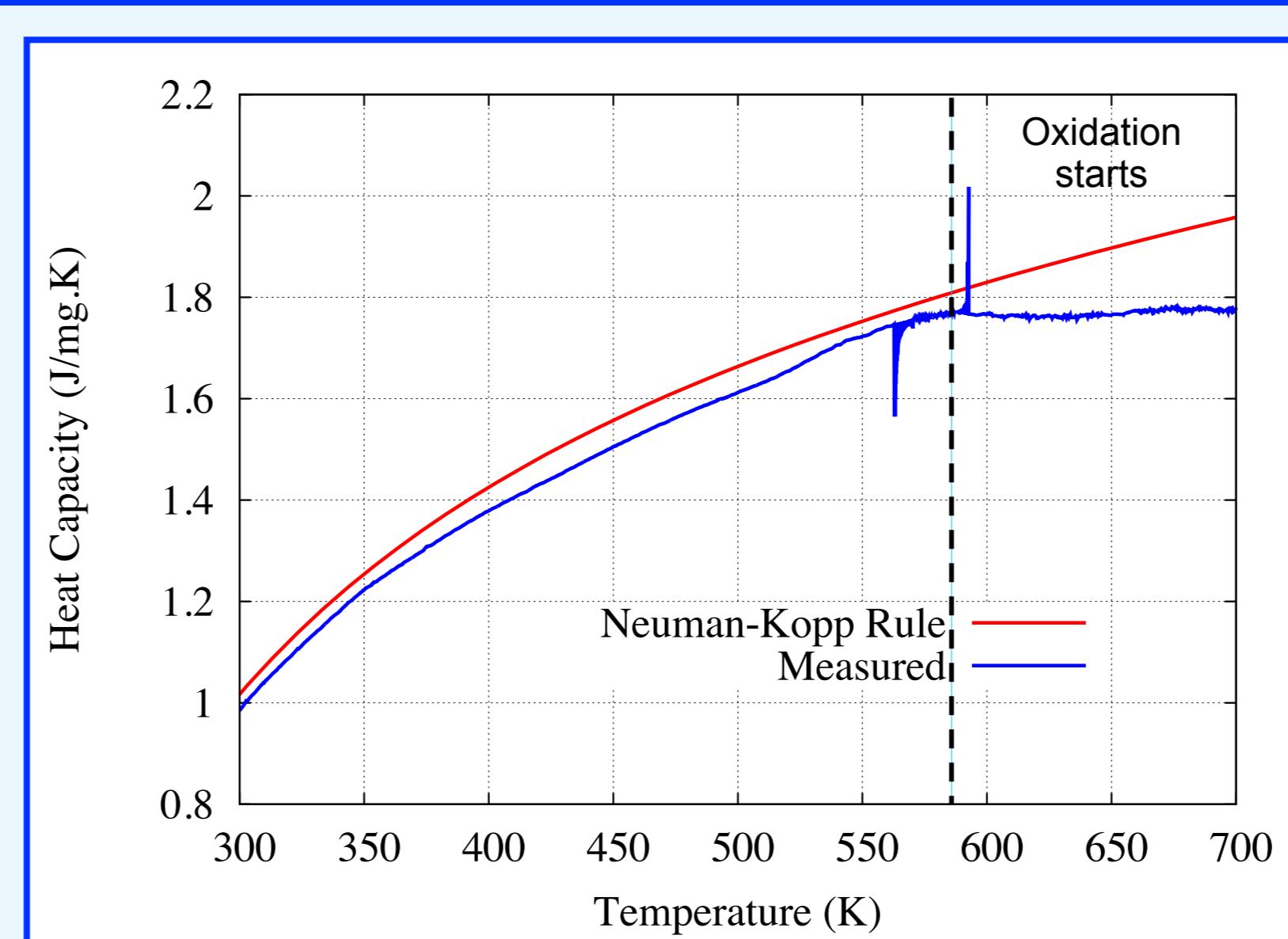
$\tau_5 - \text{Al}_3\text{BC}$

- 340h at 1173 K – Al_2O_3 crucible
 - TGA-DSC – $10 \text{ K} \cdot \text{min}^{-1}$: decomposition at $1465 \pm 10 \text{ K}$
- (reported as in between 1273-1800 K [Gon93])



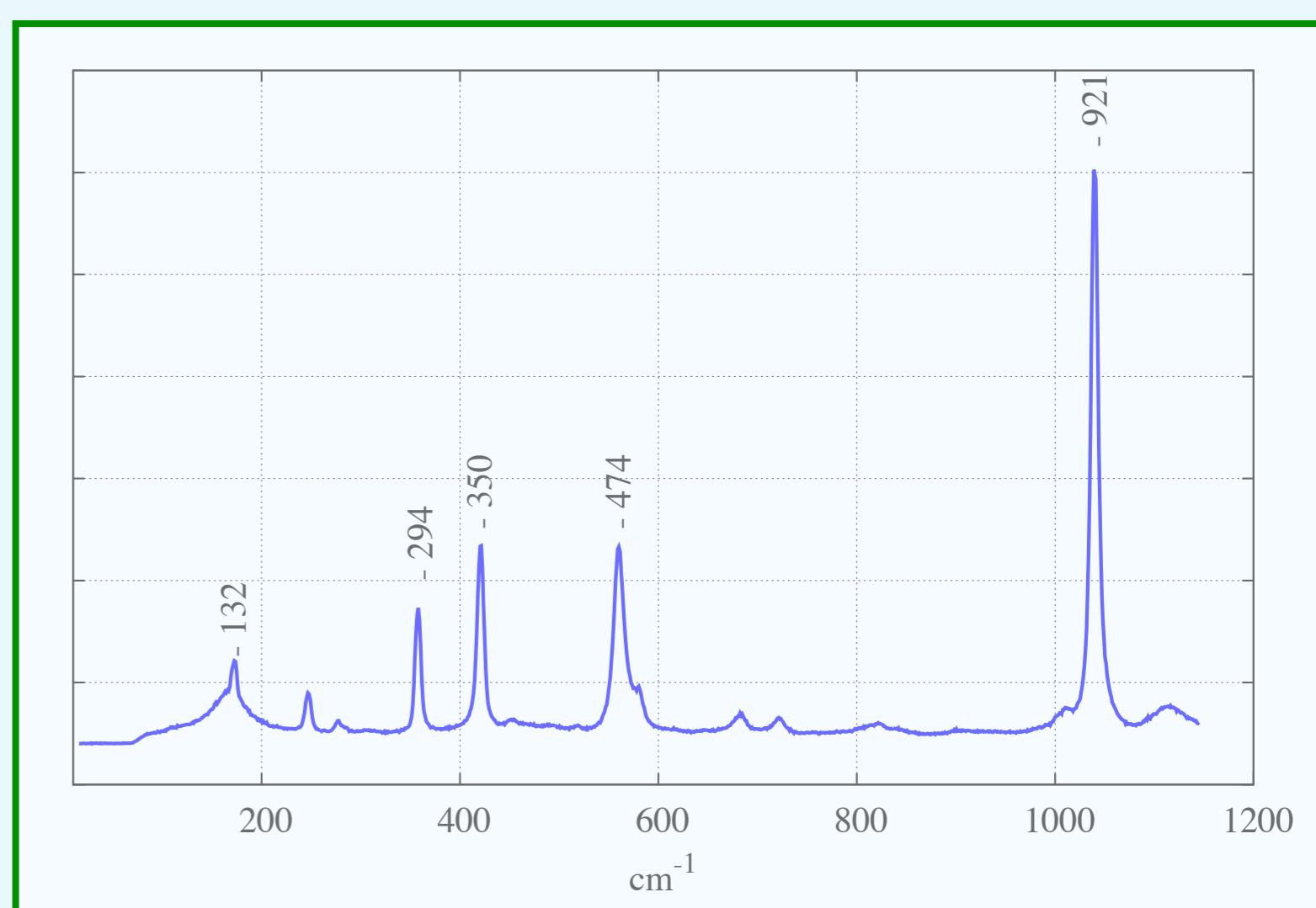
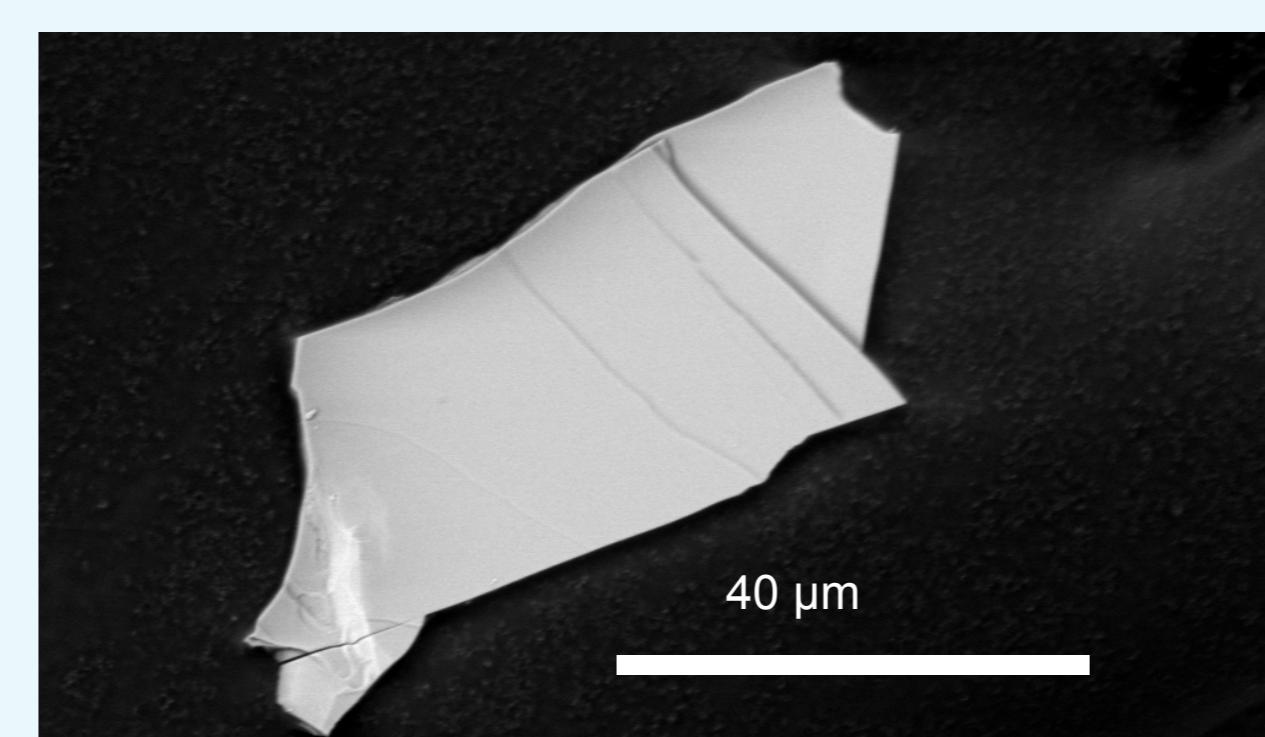
$\tau_3 - \text{Al}_3\text{B}_{48}\text{C}_2$

- 1173 K – 360h – Al_2O_3 crucible
- Al – τ_3 – τ_5 at equilibrium, only τ_3 after HCl etching
- Heat capacity measured from 0 to 573 K by sapphire method



$\tau_4 - \text{Al}_3\text{BC}_3$

- Arc melting + 1973 K – 30 min in Graphite
- Same composition in equilibrium with Al_4C_3 and with τ_1 : stoichiometric compound
- XRD and Raman spectroscopy on single crystal : structure is confirmed [Mey98]



Under progress and Future Work

- DFT calculations of $\Delta H_{298\text{K}}$
- Heat capacity measurement on τ_4
- Synthesis and characterization of τ_1 and τ_2
- Decomposition of phases by DTA (high temperature)
- Thermodynamic optimization of the Al-B-C system