

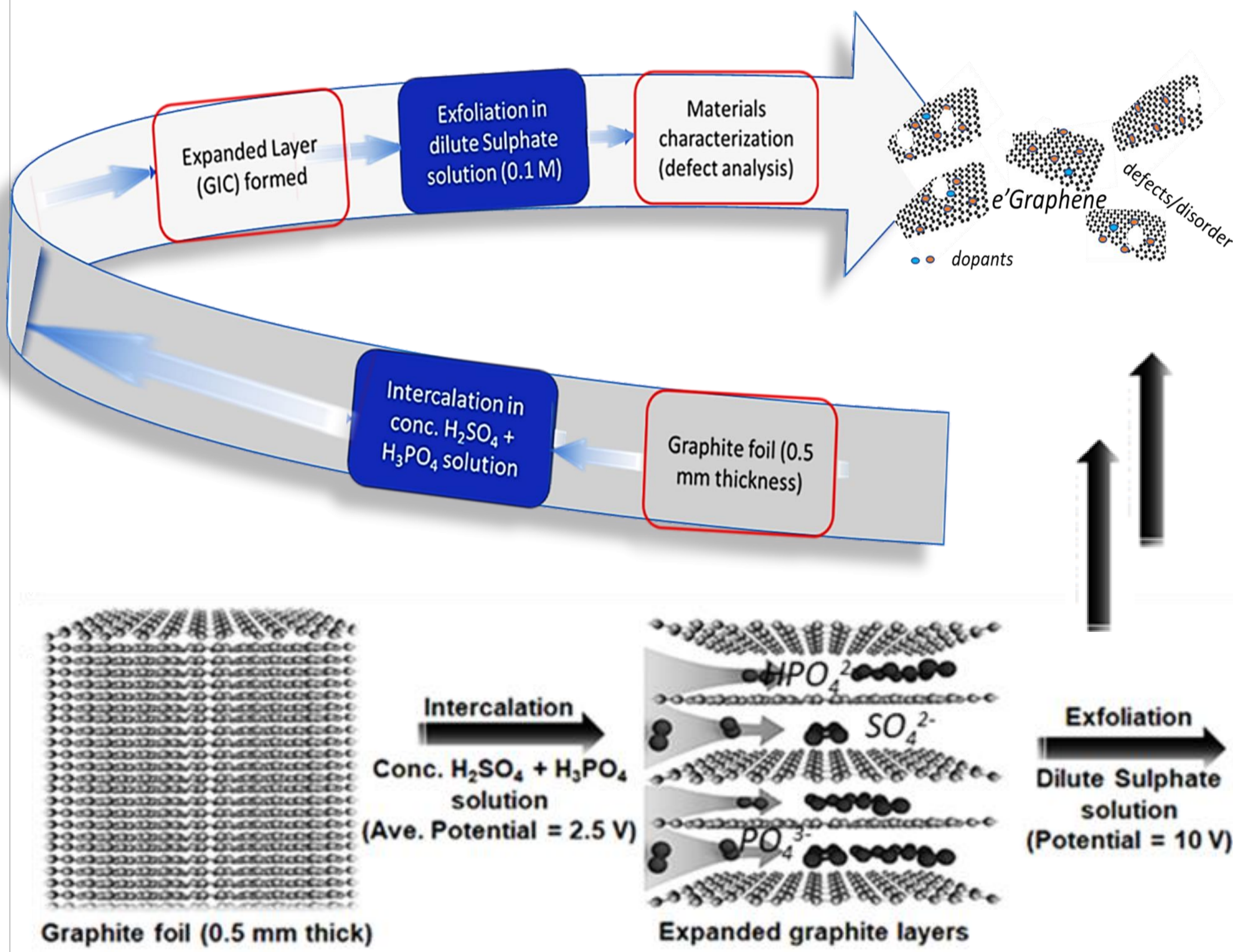


UNIVERSITY OF CALGARY

Disorder-features in thermally stable exfoliated graphene using Variable intercalation times and intercalant-blends

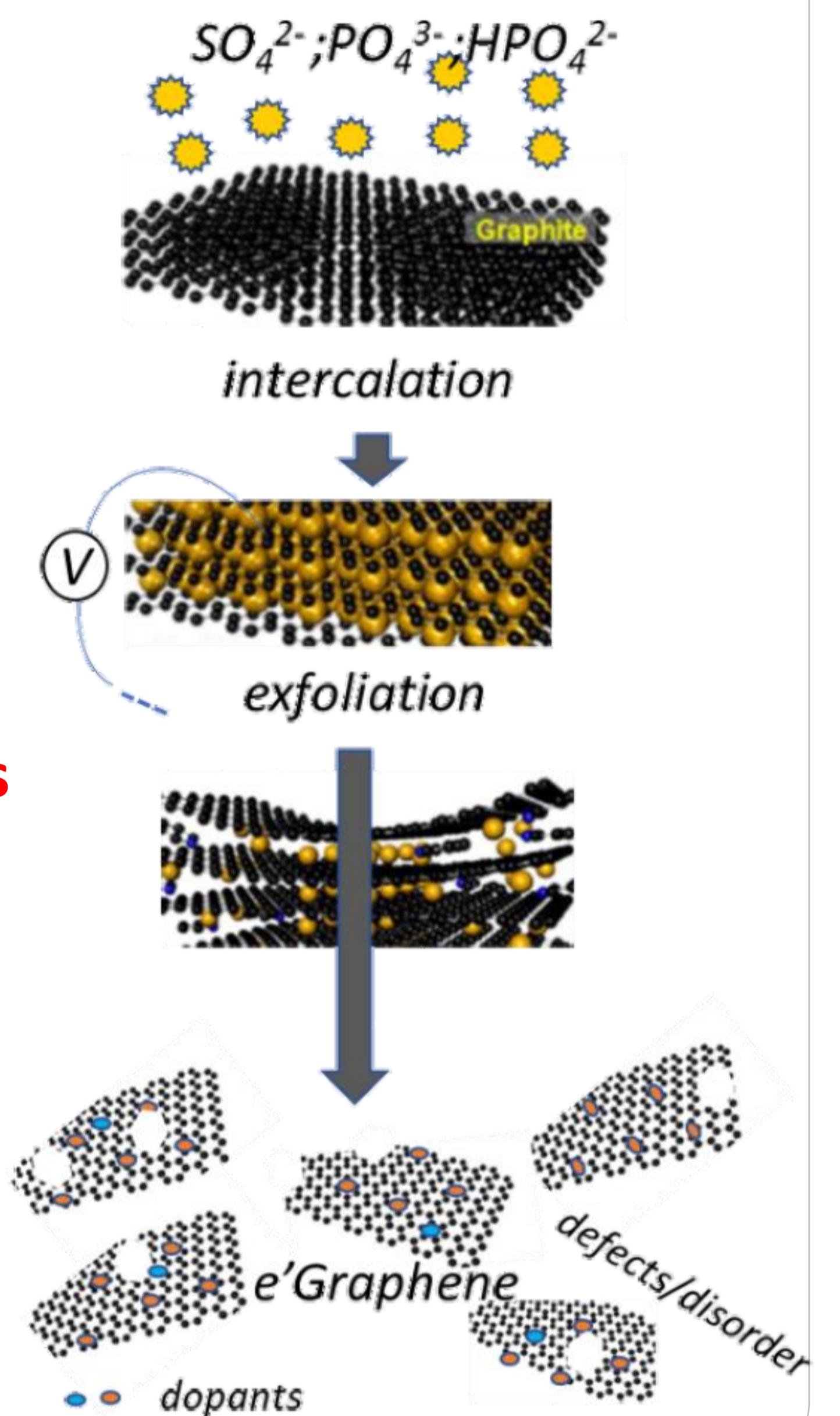
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Electrochemically doped-graphene synthesis blueprint

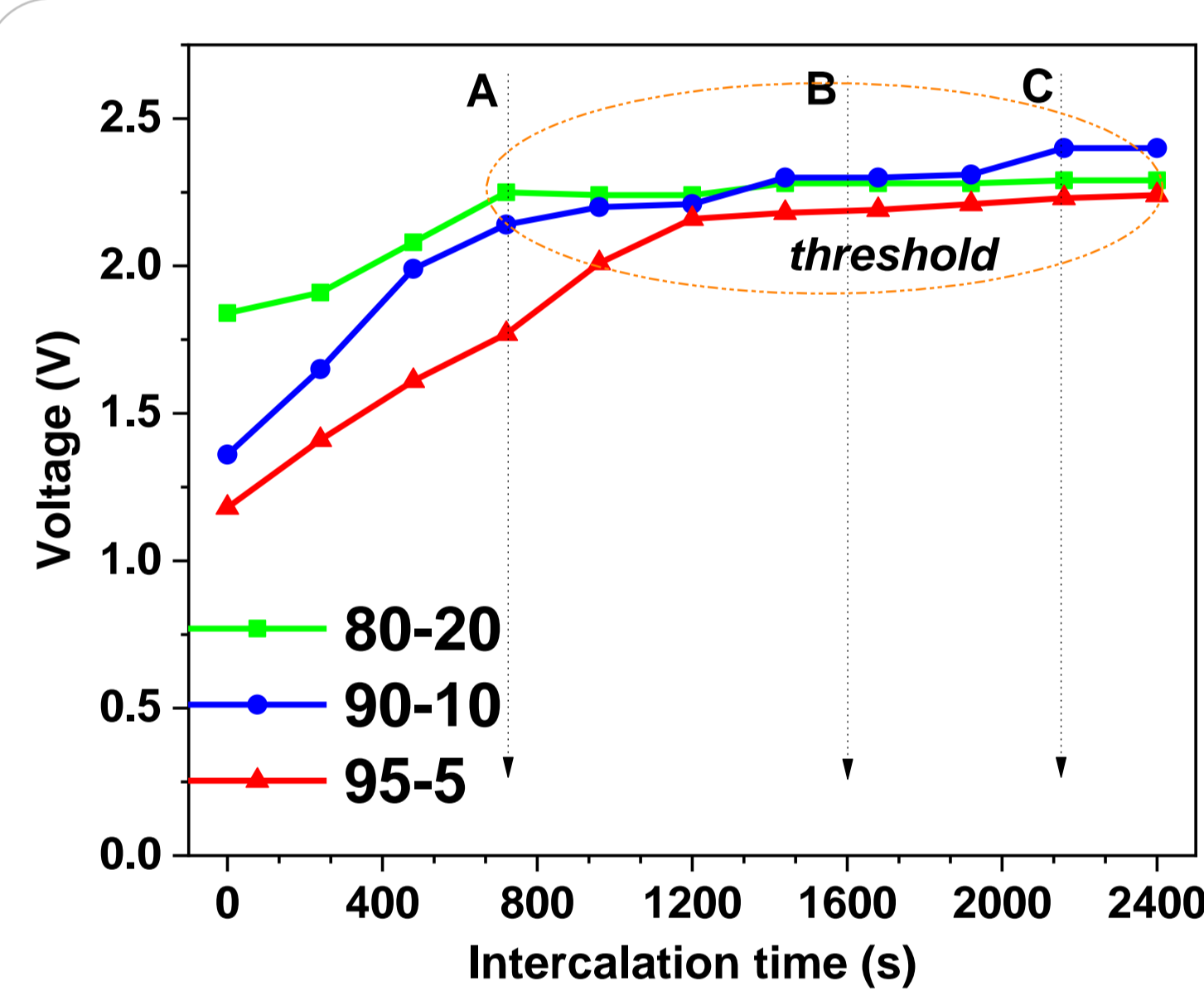


Why electrochemical exfoliation?

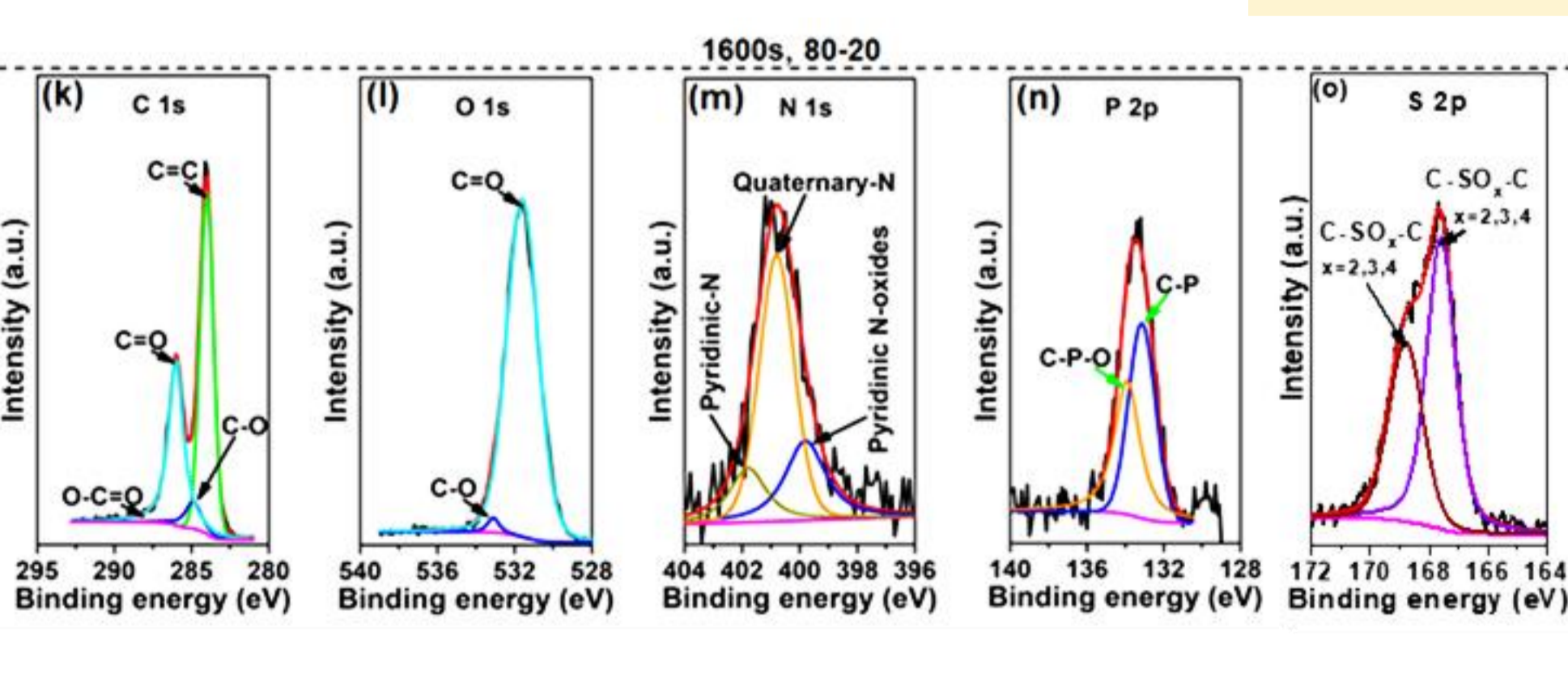
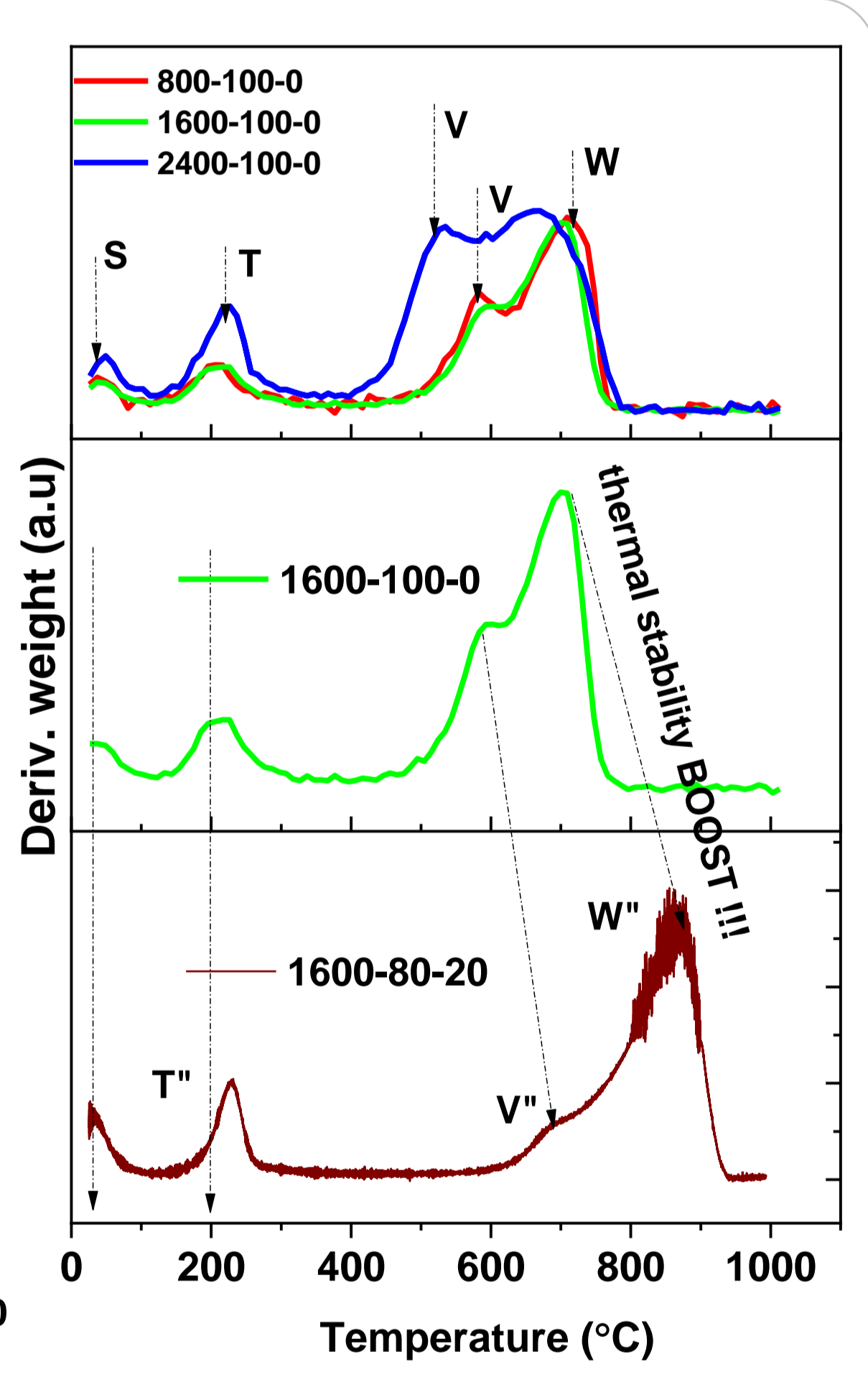
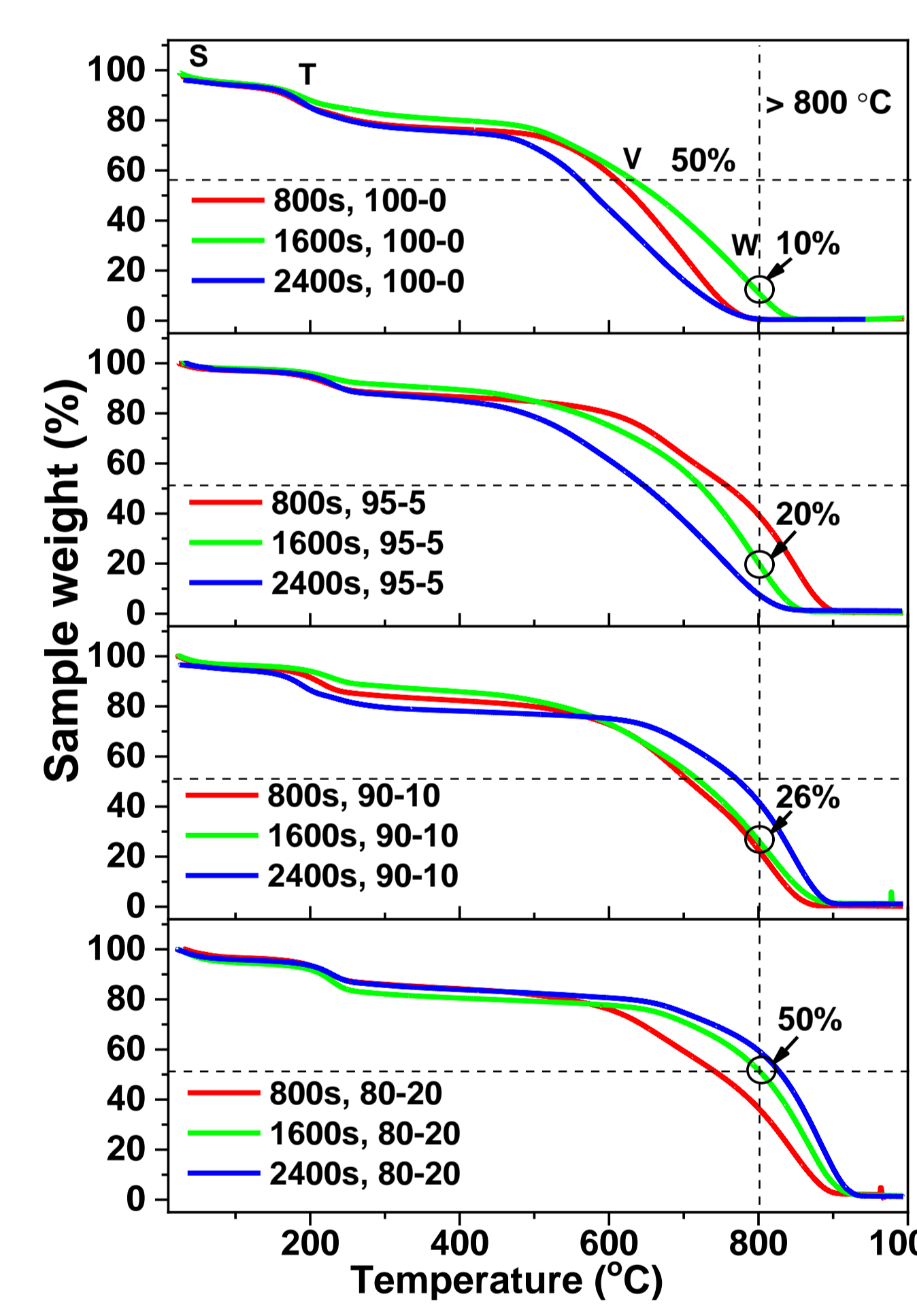
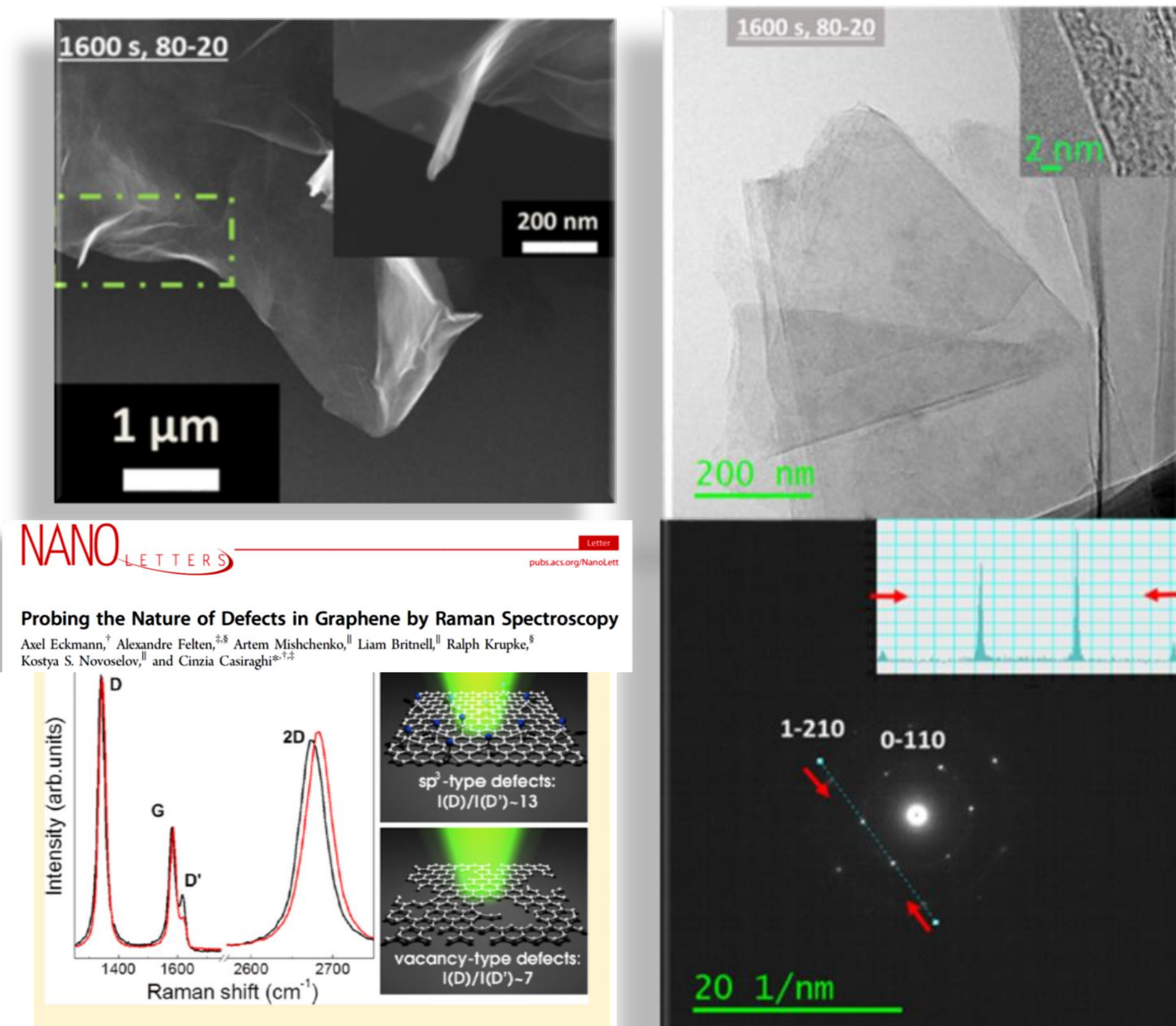
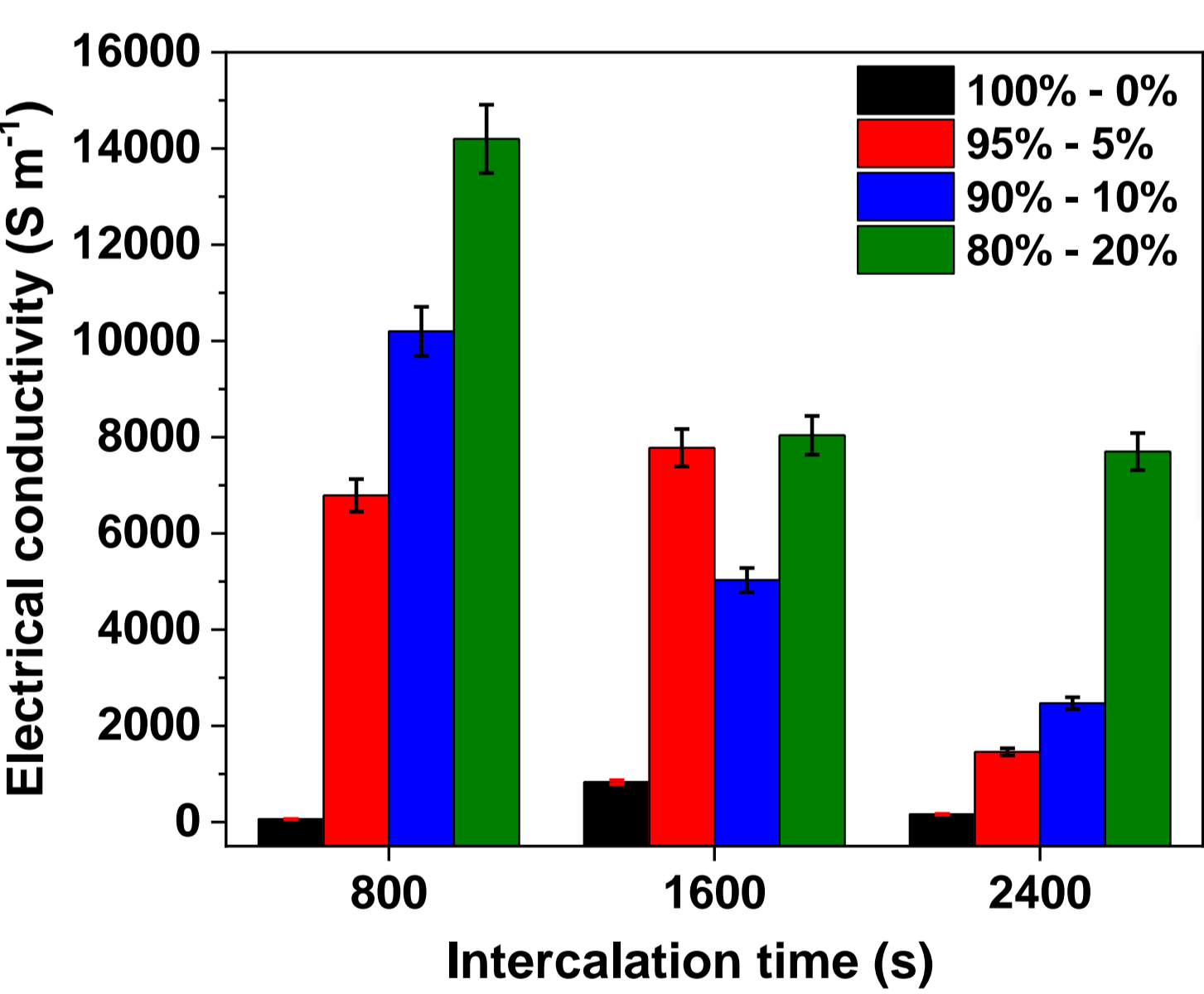
- effective exfoliation, high yield
- cost implication vs upscaling
- energy efficient recipe
- fine-tuning graphene properties
- understanding defect evolution
- tailored for specific application



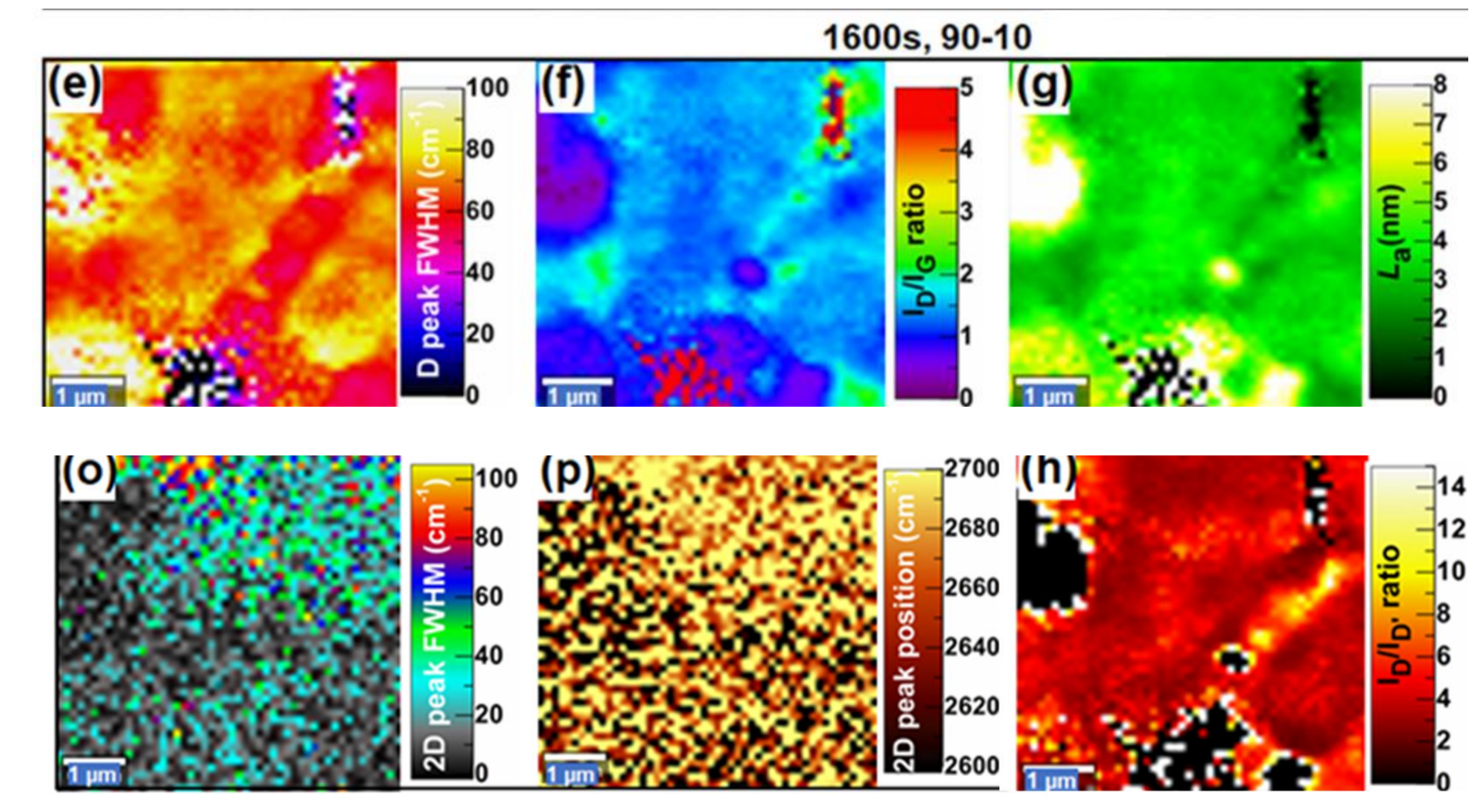
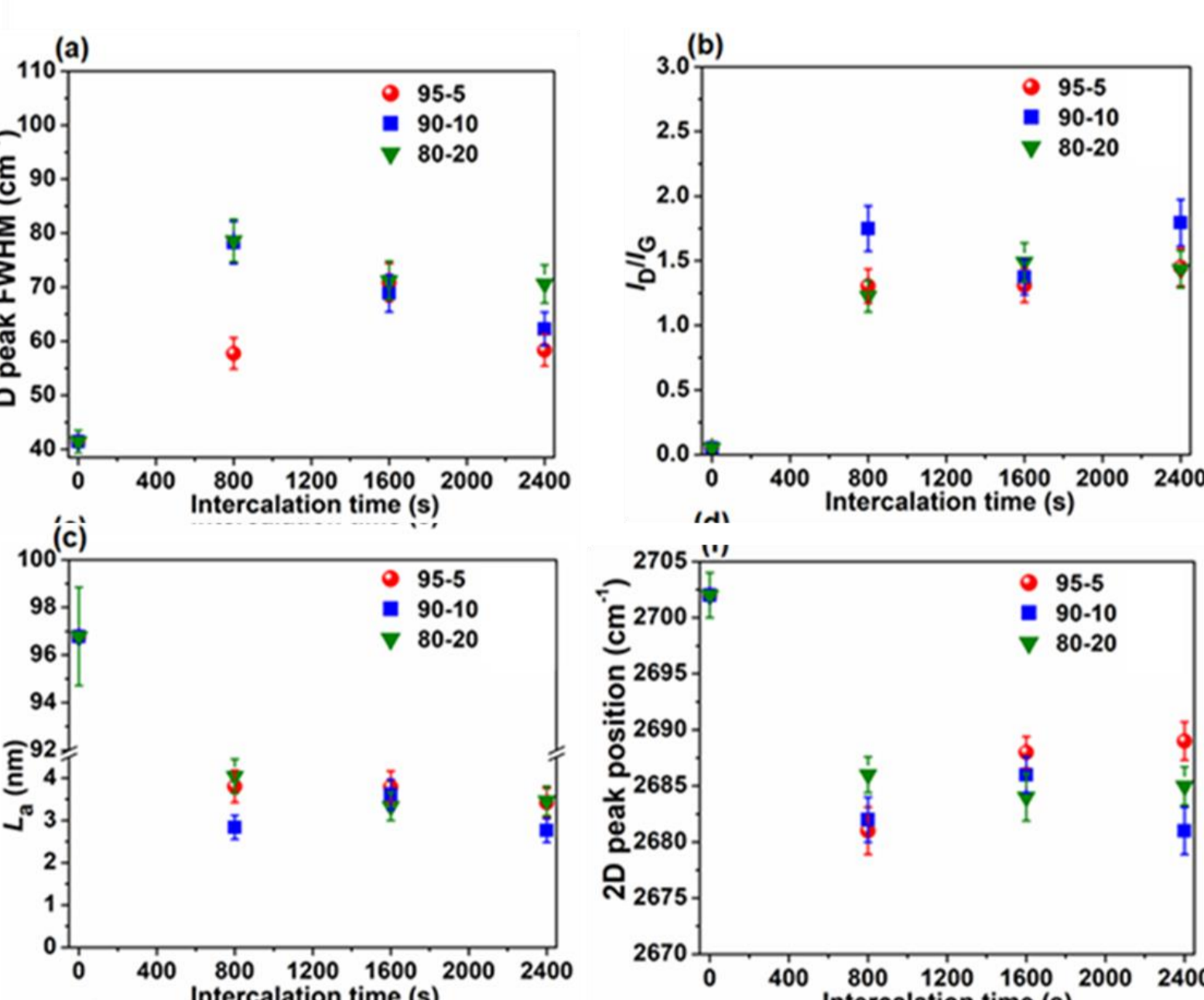
Materials Characterization



Acid blend (H ₂ SO ₄ -H ₃ PO ₄)	Exfoliation Yield (%)	Batch duration (minutes)	Energy consumption (kWh kg ⁻¹)
100-0	47.0	30 (int.) + 61 (exf.)	95
95-5	63.8	28 (int.) + 40 (exf.)	87
90-10	65.3	26 (int.) + 28 (exf.)	67
80-20	64.0	24 (int.) + 20 (exf.)	63



Acid blend (%)	C 1s (at%)	O 1s (at%)	N 1s (at%)	P 2p (at%)	S 2p (at%)
95-5	81.1	18.1	0.5	0.1	0.2
90-10	80.2	18.7	0.6	0.3	0.2
80-20	73.9	23.5	1.0	0.7	0.9



Conclusions

- Less energy consumed with H₃PO₄ ↑ (energy-saving recipe)
- Consistent defect feature at 1600 s
- L_{raman} vs defect evolution at low H₃PO₄

$$L_a (nm) = \frac{C\lambda^4}{I_D/I_G}$$

* D. Momodu et al. Carbon 171 (2021) pp. 130-141

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