Scaling Graphene for Industrial Applications

Dr. Utsab Guharoy
Dr. Dipak Kumar Chanda
Dr. Shubhadeep Maity
MATREXIA ADVANCED TECHNOLOGIES
ADDRESS: Universal enclave, North subhas Palli, Dankuni Hoogly, W.B., India, pin-712311
info@matrexia.com, s.maity@matrexia.com

Abstract
For over two decades, graphene has promised breakthroughs in energy storage, coatings, and electronics, yet industrial adoption has been limited by inconsistent production of high-purity few-layer graphene (FLG). Matrexia overcomes this barrier by manufacturing high-purity very few-layer graphene (vFLG, 1–3 layers, 236 m²/g BET) and FLG (2–4 layers) with exceptional batch-to-batch consistency at industrial scale through mechanical exfoliation [1,2]. Every batch is validated using XRD, Raman, TEM, AFM, and FESEM, ensuring laboratory-grade reproducibility. This consistency translates directly into performance: FLG-modified epoxy coatings achieve 744 h to first red rust (ASTM B117) with 5A adhesion, far exceeding commercial paints, while FLG-enhanced battery anodes deliver 265 mAh/g initial capacity, 90–94% retention after 220 cycles, and ~100% coulombic efficiency—significantly outperforming Super P. Additionally, vFLG conductive inks reach conductivities up to 10^3 S/m with excellent printability. These results demonstrate that controlled, validated FLG at scale unlocks reliable, repeatable graphene performance, enabling real industrial adoption through Matrexia's transparent and robust quality control.

References

[1] **Min Yi et. al., J. Mater. Chem. A, 22 (2015) 11700-11715**
[2] **J. Chen et. al., J. Mater. Chem, 37(2012) 19625-19628**

Figures

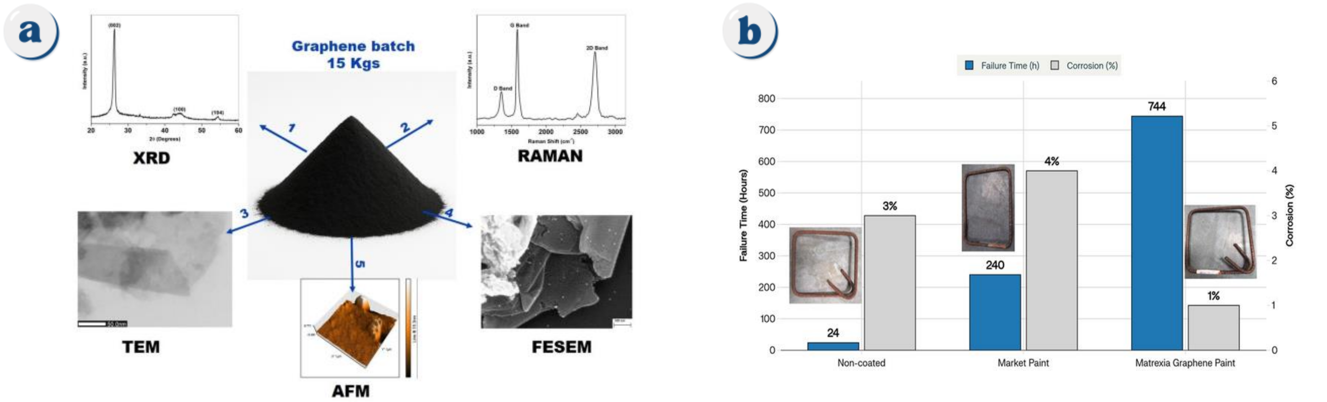
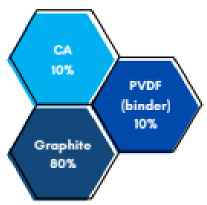


Figure 1: (a) Matrexia Few Layers Graphene Quality Control (b) Comparative Performance Analysis of Uncoated, Commercial AntiCorrosion Paint-Coated, and Matrexia Graphene-Coated Rebars in ASTM B117 Salt-Spray Test

a Electrode Composition



Cell composition	Initial capacity (mAh/g)	Capacity (300 cycle) (mAh/g)	Coulombic Efficiency
Super P	215.8	163.32	69.3%
FLG:Super P (50% each)	278.47	249.6	94%
FLG (100%)	425.27	272.17	97%

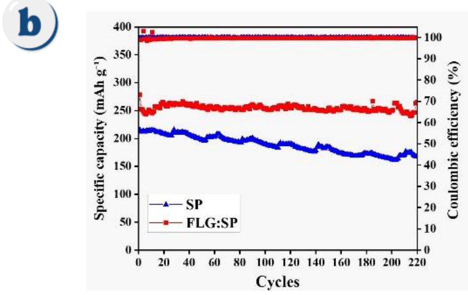


Figure 2: (a) Table of Active material (Graphite), binder (PVDF), conductive additive (CA): Super P, Hybrid and MATrexia FLG (b) Half-cell performance comparison after 220 cycles