

PRESENTED BY RI GROUP

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## GRAPHENE IN CEMENT – THE WORLD SCENARIO

- Cement contributes  $\sim 8\%$  of global  $CO_2$  emissions.
- DURABILITY AND EARLY-STAGE CRACKING ARE MAJOR CHALLENGES.
- GRAPHENE ADOPTION GROWING IN RESEARCH BUT NOT YET AT MASS SCALE.
- INDUSTRY DEMANDS SCALABLE, COST-EFFECTIVE NANOMATERIAL INTEGRATION.
- GAP: BRIDGING LAB INNOVATION AND SITE IMPLEMENTATION.

## WHY GRAPHENE IS A GAME-CHANGER FOR CEMENT

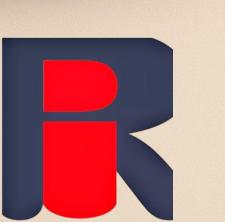
- HIGHEST MECHANICAL STRENGTH MATERIAL KNOWN (~1 TPA YOUNG'S MODULUS).
   EXCELLENT WATER BARRIER PROPERTIES DUE TO LAYERED STRUCTURE.
- ACTS AS NANO-REINFORCEMENT WITHIN C-S-H MATRIX.
- ACCELERATES CEMENT HYDRATION BY ACTING AS A NUCLEATION SITE.
- OFFERS SUSTAINABILITY ADVANTAGES BY REDUCING CLINKER DEMAND.

# RI GROUP'S SCALABLE GRAPHENE SOLUTION

- Mass-scale graphene derivatives for cement enhancement.
- OVER 5 TONS/MONTH PRODUCTION CAPABILITY ESTABLISHED.
- FORMULATED TO BLEND WITH OPC, PPC, GEOPOLYMER, LIME CEMENT.
- CUSTOMIZED SURFACE-TREATED
   GRAPHENE FOR DISPERSION STABILITY.
- 10x cost advantage compared to conventional lab graphene.

#### SCIENTIFIC & ENGINEERING BENEFITS

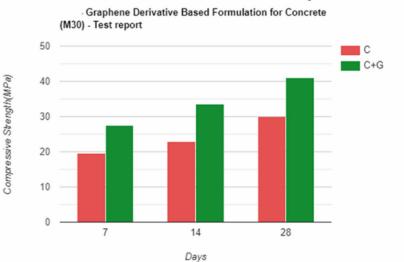
- CRACK REDUCTION: UP TO 40% FEWER MICROCRACKS, BETTER TENSILE STRENGTH.
- WATER RESISTANCE: 28–40% LOWER WATER PERMEABILITY, CHLORIDE RESISTANCE.
- FASTER CURING: 20–35% FASTER SETTING DUE TO NUCLEATION ACCELERATION.
- ✓ CO₂ REDUCTION: 10–15% CLINKER REDUCTION POSSIBLE
  PER MIX.
- CUSTOM FORMULATIONS: EFFECTIVE IN VARIED REGIONAL MIX DESIGNS.



#### USE CASES ACROSS INDUSTRY

- Infrastructure: Bridges, tunnels, highways.
- PRECAST: TILES, PAVERS, READY-MIX BLOCKS.
- 🔹 🥝 Marine: Coastal protection, port slabs, shipyards.
- A HOUSING: LOW-COST DURABLE CONSTRUCTION.
- GREEN BUILDING: LOWER CARBON CERTIFICATION POTENTIAL (LEED, IGBC).

#### EXAMPLE RESULTS (CERTIFIED)- TESTED AT THE CUSTOMER SITE



Graphene derivative based formulation for M 30 Concrete with cement reduction- with plasticiser

- · Enhanced strength with 24% reduction in cement.
- Formulation with <0.001 wt% Graphene derivative used.
- 7th day compressive strength with Graphene based additive is 20% greater than 14th day of normal concrete.
- 37% increase in 28th day compressive strength with Graphene.
- Slump and workability was within the acceptable limits.



#### PART 1: PROBLEM VS. GRAPHENE-ENABLED SOLUTION

Current Cement Industry Problem	Graphene-Enabled Solution (RI Group)	Impact/Outcome
High clinker processing temperature (~1450°C)	Graphene-enhanced reaction reduces processing temp by 300–400°C	Significant energy savings per batch
△ High limestone dependency	Lower clinker = lower limestone	Reduces raw material cost
Limited incorporation of industrial waste	Graphene enables better binding of fly ash, debris, sludges	Waste valorization & circular economy boost
Name of the second seco	Strength boost allows 10–20% less cement per m³	□ Direct material cost savings
Carbon emissions = high penalty risk	Graphene allows up to 40% CO <sub>2</sub> reduction in total emissions	Eligible for carbon credit generation
Future investment in carbon offset systems (cost)	Our method earns carbon credits instead of buying them	Potential revenue via carbon trading

## PART 2: COST SAVINGS SUMMARY

Element	Reduction Factor	Monetary Impact
Energy Cost	20–30% (temp drop)	Lower fuel/electricity usage
Limestone Usage	~15–25%	Less mining, logistics cost
Cement Volume	10–20%	Less consumption per structure
Additive Use	25–40% reuse of industrial waste	Input cost \( \), waste disposal \( \)
Carbon Credit	Up to \$25 per ton CO <sub>2</sub> saved	New <b>revenue stream</b>



#### Carbon Credit Opportunity

- •Average 1 ton of cement emits ~0.9 ton CO<sub>2</sub>
- •Graphene-enhanced cement can cut this by ~0.35 ton
- •1 Carbon Credit  $\approx$  1 ton CO<sub>2</sub> avoided = \$25
- •If producing 1 million tons annually:
  - You save ~350,000 carbon credits
  - Potential carbon revenue: \$8.75 million/year

### "RI GROUP'S GRAPHENE INTEGRATION DOESN'T JUST ENHANCE CEMENT

IT TURNS A LIABILITY INTO AN ASSET BY CREATING STRONG, GREEN CEMENT READY FOR TOMORROW'S ECONOMY."

JOIN THE FUTURE OF CONSTRUCTION MATERIALS

PARTNER WITH RI GROUP TO COMMERCIALIZE GRAPHENE-BASED CEMENT.

- CONTACT US FOR PILOT SAMPLES, TECH SHEETS, OR BULK ORDERS.
- INSTRUMENTRI@GMAIL.COM
  - WWW.RIIIGROUP.COM

