



Proposal: *Graphene-Enhanced BioPlastic*
Jefford J. Humes – NanoIntegris Technologies Inc.



smart

advanced manufacturing

Insert brief description of the leading organization: Name, Personnel, Size, Products/Services/Technical areas and R&D project expertise.

NanoIntegris Technologies/ Raymor Industries Inc.

Personnel

Jefford Humes – Director of Research & Business Development

Norma Mendoza - Modeling and Plasma Systems Specialist

Angela Delgado - Director of Quality

Helen Lu – Research Scientist

Liviu Ciuca - Engineering Director

James Bernardino – Research Technician

Marcela Felix-Rocha - Laboratory Technician

Size: Small Business

NanoIntegris Technologies was created to purify and separate single-walled carbon nanotubes by electronic type (semiconducting or metallic). This functionality has since increased, leading to the supply of 99+% semiconducting and metallic products in solution or solid form, and the scope of the supplied nanomaterials has grown to include graphene, boron nitride nanotubes, small diameter nanotubes, dielectrics, multi-walled nanotubes, and transparent conductive inks. Raymor's parent company specializes in the use of an inductively coupled plasma reactor to synthesize high purity single walled carbon nanotubes and low-layer Graphene at commercial levels.

PROPOSAL INTRODUCTION (I)

Vision: main project goal

The synthesis and commercialization of a Graphene-enhanced composite material which can be utilized for 3D Printing Filaments of BioPlastic allowing for biodegradability and enhanced mechanical and electrical properties.

Motivation: why the project is necessary

Environmental Benefit: Switching all plastics to biodegradable materials would reduce greenhouse emissions by 25+ percent in US alone (I Daniel Posen et al 2017 Environ. Res. Lett. 12 034024) with greater worldwide benefit.

Market Potential: The Global 3D printing materials market (for plastics) is estimated to grow from \$687 million (USD) in 2019 to \$2.1 billion by 2024, at a CAGR of 26% during the forecast period (Prescient Strategic Intelligence; MarketsandMarkets Inc.). Bioplastics are predicted to control a 40 percent market share by 2030, making bioplastics a \$324 billion-dollar enterprise (European Bioplastics 2013)

Content: which are the developments to be made in the project

1. Selection of Target Polymer/ Graphene components
2. Stable, efficient, and cost-effective compounding technique
3. Manufacture of 3D filament
4. 3D printing of functional Graphene Bioplastic.

PROPOSAL INTRODUCTION (II)

Expected outcome: descriptions of the results to be obtained in the project

Development of Graphene Enhanced BioPlastic composite, cost performance material optimization, commercial scale manufacturing strategy, establishment of manufacturing, marketing, and consumption network.

Impacts: what will be the expected market impact of the project

Attract 3D printing filament/ adaptive manufacturing markets with Graphene functional additives:

ELECTRONICS : Printable/flexible electronic sensor applications

MEDICAL : Customized medical products, tools and devices

INDUSTRIAL (Additive Manufacturing)): Faster Product Development Cycles; Simplified and Significantly Less Expensive Supply Chain Logistics, Easy to Change or Modify a Product, Reduced Production Waste; Faster and less costly Product Certification Process; Material and Energy Savings

Schedule: start and end dates for the project. Duration.

Phase 1 - Experimentation: January - March 2021

Phase 2 – Scale-up: March – June 2021

Phase 3 – Manufacturing/ Testing: July – August 2021 [Project "End"]

Phase 4 – Commercialization: September / October 2021

PARTNERS

Current Consortium: list of partners already involved in the project

[NONE CURRENTLY]

Partner search: type of partner searched and countries of origin (if necessary).

Compounding Specialists

Additive Masterbatching team

Plastic property analyzers

Industry-sensitive marketing team



CONTACT INFO

Contact info: of the person coordinating the project proposal

Jefford J. Humes

Director of Research & Business Development
NanoIntegris Technologies Inc.

Raymor Industries Inc./ SEC Graphene

Northwestern University -

Visiting Scholar, Hersam Group

3765 La Vérendrye

Boisbriand, Québec

J7H 1R8, Canada

Phone 1: 866-650-0482 x 1

Phone 2: 224-688-9065

Phone 3 : 847-467-0155

Fax: 886-650-0482

Email: jhumes@nanointegris.com

URL: www.nanointegris.com / www.raymor.com

