New Nano Additives Patented and Recently Produced for Engineering Plastics Upgrade

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Abstract

A major obstacle to the application of plastics in engineering is the mechanical strength, toughness, wear and tear resistance. One way to improve engineering plastics is to enhance the mechanical strength by the addition of Nano composite whiskers. SiC Nano whiskers and Al_2O_3 Nano whiskers therefore have been aimed by bonding with raw pellets and other additives as composite reinforcing materials for conventional engineering plastics upgrade. Concentrated efforts have recently commercially produced by our USA Patent technology # US8426328 for two new Nano additives "**silicon carbide (SiC) whiskers and alumina (Al_2O_3) whiskers"**.

Two new Nano additives can be utilized as a process drop-in technology to achieve an overall solution for commercial engineering plastics upgrade. The new Nano additives can upgrade engineering plastics, specialty plastics and thermoplastics for application areas included aerospace, automotive parts, transportation, engineering accessory parts, construction heavy duty equipment, and explosion-proof safety.

Introduction

Our patented production technology is available for licensing to produce commercially two new Nano additives**.** Conventional engineering plastics by adding new Nano additives can upgrade for major technical indicators included higher mechanical strength, higher wear and tear strength, better corrosion and chemical resistance, higher temperature and lower temperature resistance. Our licensing project team can offer Nano technology consultation at field polyolefins laboratory. We can bring free 2 kg of Nano additives to perform R & D testing a small ratio and different combinations mixed with raw sample pellets. The field analytical laboratory can test results on-site to compare major technical indicators between "Without" and "With" adding Nano additives. R & D tested samples can be analyzed to confirm polymer upgrade results such as higher Flexural Modulus, higher Notched IZOD Impact Strength, and higher Tensile Strength, etc.

Our Nano technology can provide an overall solution for conventional engineering plastics upgrade to new Nano products:

- Produce high-end polyolefins for conventional engineering plastics, thermoplastics and specialty plastics made of PE/PP/PVC
- Upgrade conventional polyolefins for their major technical indicators included higher mechanical strength, higher wear and tear strength, better corrosion and chemical resistance, higher and lower temperatures resistance

Materials

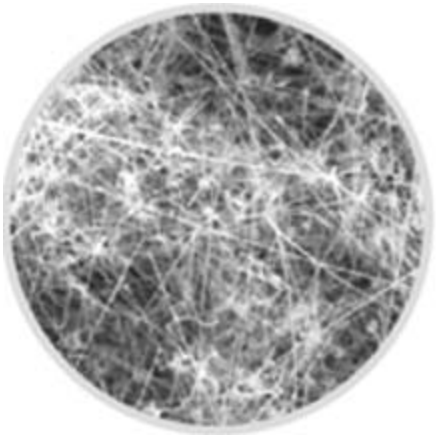
Two Nano additives have been commercially produced by our USA Patented Technology with Patent # US8426328. (**Figure 1**).

Figure 1. USA Patented Nano Technology [1] [2]

The new Nano additives can be utilized to mix a small ratio and different combinations with the raw pellets and other additives.

Two patented Nano additives, one is Nano silicon carbide whiskers and the other is Nano alumina whiskers (**Figure 2**) examined under an electron microscopy.

Figure 2. The photo of Nano whiskers examined under an electron microscopy [1] [2]



Production Technology of Patented Nano Additives available for licensing

We can offer Nano technology transfer for commercially producing new Nano additives. Successful application for engineering plastics included aerospace, transportation, energy, engineering heavy duty equipment, and blast-proof areas. Conventional engineering plastics can be improved for major technical indicators included higher mechanical strength, higher wear and tear strength, better corrosion and chemical resistance, higher temperature and lower temperature resistance.

Our Nano technology project team can offer R&D consultation:

- Free Nano additives sample testing at client polyolefins laboratory site. We can bring free 2 kg Nano additives as a small ratio and different combinations mixed with sample pellets for on-site laboratory testing.

- The analytical laboratory can compare upgrade results for major technical indicators between "Without" and "With" adding Nano additives.

The R & D tested samples can be measured for upgrade results included higher Flexural Modulus, higher Notched IZOD Impact Strength and higher Tensile Strength, etc.

Joint Venture Company

The US China Nano technology Company had been built in 2015 (**Figure 3**)**.** The Joint Venture company has focused in Production, Sales and Market Application for Nano SiC whiskers and Nano alumina whiskers. The USA company can offer strong R & D capabilities and technical support to build Nano additives commercial production lines.

Figure 3. The US China Joint Venture Nano technology Company [2]

Figure 4. The Nano R & D Laboratory is shown as below:

Technology Application - Aerospace

The PTFE engineering plastics is widely used in aerospace wiring. The Nano SiC additives applied on

PTFE coating can reduce wear & tear abrasion (**Figure 5**).

Figure 5. PTFE is widely used for aerospace application

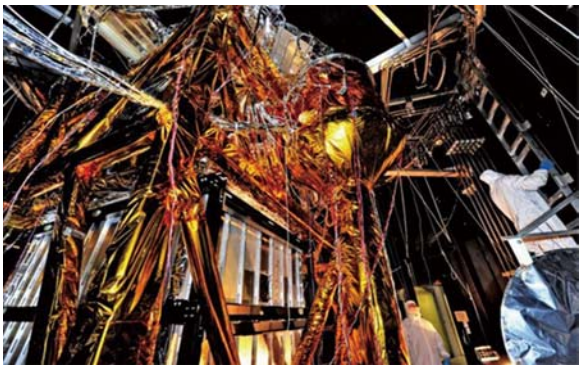
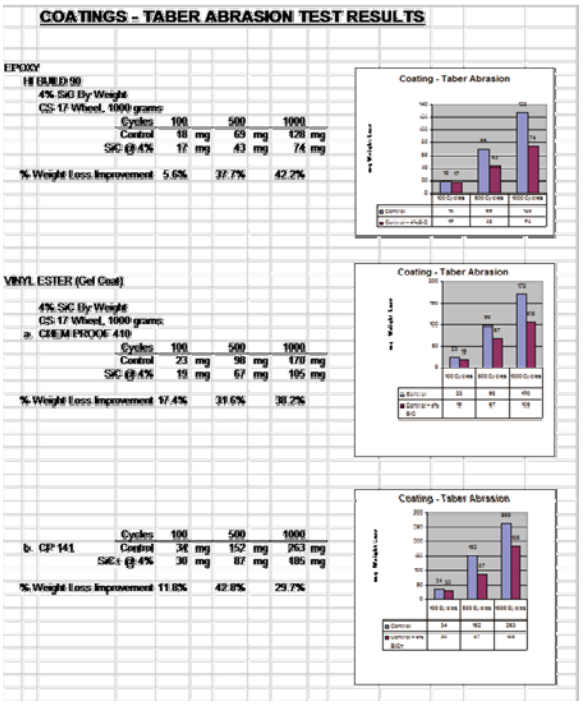


Table 1 shows adding 4% Nano-SiC additives for Epoxy and Vinyl Ester to reduce 32% - 42% on wear and tear abrasion resistance.



COATINGS - TABER ABRASION TEST RESULTS

EPOXY
HI BUILD 90
4% SiC By Weight
CS-17 Wheel, 1000 grams:

Cycles	100	500	1000
Control	18 mg	69 mg	128 mg
SiC @ 4%	17 mg	43 mg	74 mg
% Weight Loss Improvement	5.6%	37.7%	42.2%

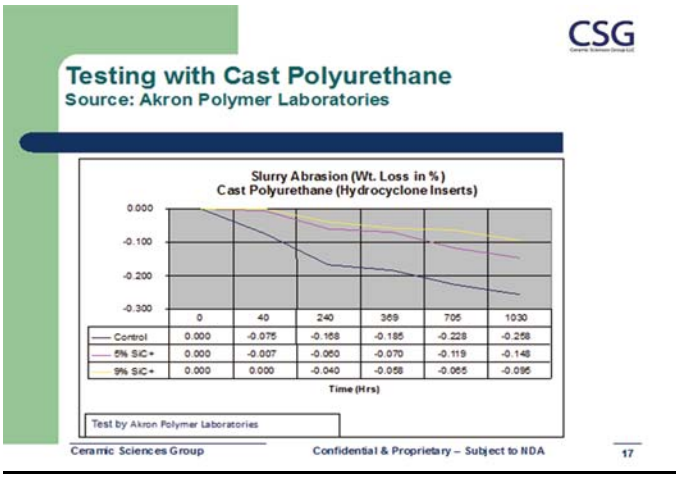
VINYL ESTER (Gel Coat)
4% SiC By Weight
CS-17 Wheel, 1000 grams:
a. CHEM PROOF 410

Cycles	100	500	1000
Control	23 mg	98 mg	170 mg
SiC @ 4%	13 mg	67 mg	105 mg
% Weight Loss Improvement	97.4%	31.6%	38.2%

Cycles	100	500	1000
b. CP 141 Control	34 mg	152 mg	263 mg
SiC @ 4%	30 mg	87 mg	185 mg
% Weight Loss Improvement	11.8%	42.8%	29.7%

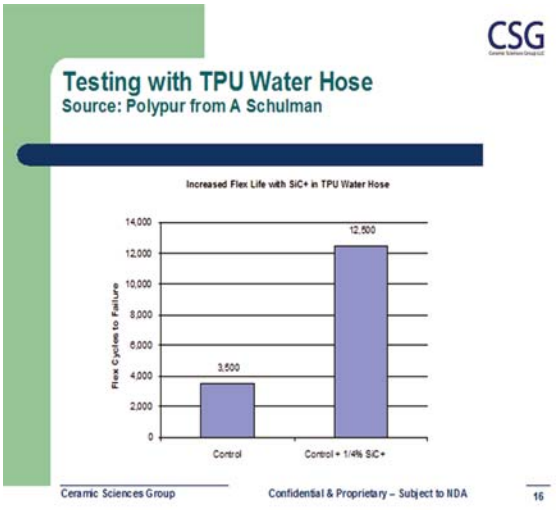
Technology Application - Engineering Plastics

Figure 6 shows adding 9% Nano-SiC additives for Polyurethane applied for High-Speed Rail Sleeper can reduce wear and tear abrasion resistance about 3 times.



Technology Application - Engineering Plastics

Figure 7 shows the testing data by adding 2.5% Nano-SiC additives for specialty plastics applied for water pipes can extend pipe life span by 4 times as below.



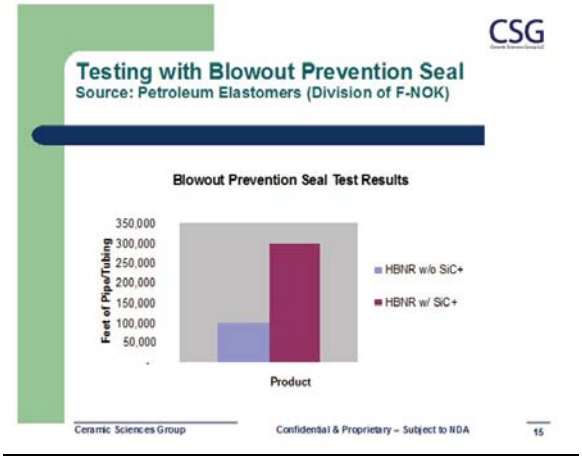
Technology Application - Engineering Plastics

Adding 9% Nano-SiC additives applied for plastic/rubber seals can increase mechanical strength by 3 times. Nano technology plastics can be applied on under-sea Blow Off Seals (BOP) for protecting oil well pressure against explosion strength by 3 times. The BOP seals had been tested by respectful German and Japanese Inspection Company (**Figure 8**). "Without" Nano-tech, BOP seal only bear 100,000

feet, but "With" Nano-tech BOP seal can bear 300,000 feet.

"With" Nano-tech BOP seals can also raise Maintenance Efficiency by 3 times to lower seal maintenance costs. "Without" Nano-tech, BOP seals continue drilling before 100,000 feet had to change the seal, but "With" Nano-tech BOP seals allow every 300,000 feet to change seal. Maintenance efficiency can be extended by 3 times (**Figure 8**).

Figure 8. The Nano-BOP seals had been tested by respectful German and Japanese Inspection company.



Technology Application - Engineering Plastics or Specialty Plastics

Upgrade HDPE engineering plastics (UHMWPE) to super mechanical strength for the light weight, strong Body Armor as **Figure 9** below.

Business Model - R & D Consultation

- Our project team can offer Nano technology consultation at field polyolefins laboratory. We can bring free 2 kg of Nano-additives to perform R & D testing for a small ratio and different combinations mixed with raw sample pellets.
- The on-site analytical laboratory can test sample results to compare (**Figure 10**) "Without" or "With" adding Nano additives for main technical indicators upgrade between "Without" and "With" adding Nano additives.
- The field analytical laboratory can examine R & D tested samples to confirm polymer upgrade results such as higher Flexural Modulus, higher Notched IZOD Impact Strength, and higher Tensile Strength, etc.

Figure 10. The field analytical laboratory for R & D samples testing on-site

Business Model – Technology Transfer

- We (Patent Technology Owner) can offer Nano technology transfer for commercially producing two new Nano additives
- Due to sensitivity of Nano technology data, our project team can meet potential investor for 2 to 3 days meeting with an NDA signed before technical discussion.
- Our Nano technology team will release data, photos, patented technology and two Nano additives commercial production lines
- You (Investor Company) to fund $5 million for the joint-venture partnership company
- Investor funds mainly used for Nano patented technology transfer, and to build two Nano additives commercial production lines.

- Within a year, a joint-venture partnership company (You/Investor 51%, We/Patent Owner 49%) may be established.

Conclusions

- Two New Nano additives can be utilized to upgrade mechanical strength for conventional engineering plastics in application of heavy duty equipment, automotive parts, engineering accessory parts, and blast-proof areas, etc.
- Our licensing project team can offer patented Nano additives consultation and technology transfer for two Nano additives commercial production lines
- Nano additives technology is targeting to upgrade engineering plastics made by PE, PP, PVC

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