Fine Finish News

VOL -22

INSIDE

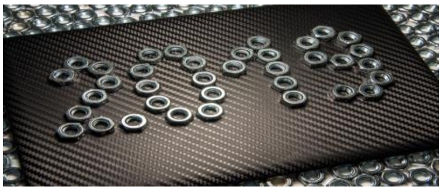
Editor's Note

As the new year 2019 dawns, we are proud to present the 22nd edition of Fine Finish News.

As the year 2018 comes to an end, we would like to look back at some of the major developments that happened here at Fine Finish. We have set up various new test facilities, composite processing facilities, new manufacturing unit, newer and more innovative products, and a modified R & D unit.

Fine Finish Team believes in the mantra- Every new year is about growth, progress and being better than yesterday. Therefore, we are proud to inform you that Fine Finish will be participating in ICERP 2019- International Conference & Exhibition on Reinforced Plastics. We will be exhibiting our products and test capabilities. Come visit us in Stall A-12 and A-13 from January 10 - 12, 2019 for technical discussions and value-added solutions.

Until then, Fine Finish Team wishes everyone a very Happy New Year!!



- Dr. G. S. Prabhu

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NEW PRODUCTS

Acid Resistant Coating (Epofine 661/Finehard 460)

Epofine 661 is a highly chemical resistant grade epoxy novolac resin. Finehard 460 is a modified amine. This system is recommended for room temperature curing. This system is suitable for manufacturing of chemical resistant coatings for chemical plants, water treatment plants, sewage treatment plants and structures exposed to coastal environment. If the substrate is highly polluted atmosphere, then multiple coats may be required to attain a resin rich surface.

The system has excellent features like high temperature resistance, excellent resistance to boiling water, very low water absorption, very good chemical resistance and electrical insulation. Epofine 661 can be cured with modified amines, catalytic curing agents, anhydrides and aromatic amines. All major major mechanical test facilities like tensile properties, impact strength, flexural properties, impact strain, compressive properties by end loading can be performed in our accredited mechanical testing lab. We can also perform thermal tests like glass transition temperature in our accredited chemical testing lab. Other tests which can be performed successfully on these systems are thermal conductivity, thermal class and coefficient of linear thermal expansion.

\- **Kishore Prabhu**

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Epofine 0396

Epofine 0396 is a trifunctional reactive diluent which is triglycidyl ether of trimethylol propane. This is a high-performance reactive diluent for DGEBA Resins. All chemical tests like dynamic viscosity, density, flash point and epoxy value can be conducted in our accredited chemical testing facility. Epoxy Value for this reactive diluent is done as per ISO 3001 which is not conventionally used like ASTM D 1652.

When determinations are carried out on nitrogen containing epoxy resins using the method described in the body of this international standard. The values determined for the epoxy equivalent are too low. This is due to a reaction between the perchloric acid and the amino nitrogen which leads to formation of salt. If account is taken of the perchloric acid involved in the formation of salt, then the method can also be used to determine the epoxy equivalent of epoxy amines.

The amino nitrogen in the epoxy amine is determined by titrating against 0.1 mol/L standard volumetric perchloric acid solution. The second blank value thus obtained is used as correction in the calculation of the epoxy equivalent.

- **Kishore Prabhu**

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NEW TEST FACILITIES

Fine Finish - In-house R &D unit has recently purchased a Shimadzu make Gas chromatograph

Gas chromatography (**GC**) is a common type of chromatography used in analytical chemistry for separating and analyzing compounds that can be vaporized without decomposition. Typical uses of GC include testing the purity of a substance or separating the different components of a mixture (the relative amounts of such components can also be determined). In some situations, GC may help in identifying a compound. In preparative chromatography, GC can be used to prepare pure compounds from a mixture.

In gas chromatography, the mobile phase (or "moving phase") is a carrier gas, usually an inert gas such as helium or an unreactive gas such as nitrogen. The stationary phase is a microscopic layer of liquid or polymer on an inert solid support, inside a piece of glass or metal tubing called a column. The instrument used to perform gas chromatography is called a gas chromatograph.

The GC-2014 at Fine Finish is microprocessor based modular GC system with capillary column injection port with single flow line advanced flow controller (AFC) and high sensitivity single FID detector. Accurate flow rate control via AFC has higher-level repeatability of retention time and peak area, enabling a higher level of analysis. High reproducibility and low carryover of system ensure reliable quantitation for volatile component analysis.

This system can also be utilized for the applications like,

- Measurement of residual solvents in pharmaceuticals
- Measurement of flavor components in foods

- **Suvarna Gondhali**

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TECHNICAL ARTICLE

E-Mobility

An **electric vehicle**, also called an **EV**, uses one or more electric motors or traction motors for propulsion. An electric vehicle may be powered through a collector system by electricity from off-vehicle sources, or may be self-contained with a battery, solar panels or an electric generator to convert fuel to electricity.[1]EVs include, but are not limited to, road and rail vehicles, surface and underwater vessels, electric aircraft and electric spacecraft.

During the last few decades, environmental impact of the petroleum-based transportation infrastructure, along with the fear of peak oil, has led to renewed interest in an electric transportation infrastructure. EVs differ from fossil fuel-powered vehicles in that the electricity they consume can be generated from a wide range of sources, including fossil fuels, nuclear power, and renewable sources such as tidal power, solar power, and wind power or any combination of those. The carbon footprint and other emissions of electric vehicles varies depending on the fuel and technology used for electricity generation. The electricity may then be stored on board the vehicle using a battery, flywheel, or supercapacitors. Vehicles making use of engines working on the principle of combustion can usually only derive their energy from a single or a few sources, usually non-renewable fossil fuels. A key advantage of hybrid or plug-in electric vehicles is regenerative braking, which recovers kinetic energy, typically lost during friction braking as heat, as electricity restored to the on-board battery.

Electricity sources:

There are many ways to generate electricity, of varying costs, efficiency and ecological desirability.

Connection to generator plants

- direct connection to generation plants as is common among electric trains, trolley buses, and trolley trucks
- Online Electric Vehicle collects power from electric power strips buried under the road surface through electromagnetic induction

Onboard generators and hybrid EVs

- generated on-board using a diesel engine: diesel-electric locomotive
- generated on-board using a fuel cell: fuel cell vehicle
- generated on-board using nuclear energy: nuclear submarines and aircraft carriers
- renewable sources such as solar power: solar vehicle

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Onboard storage

- On- board rechargeable electricity storage system (RESS), called Full Electric Vehicles (FEV).Power storage methods include:
- chemical energy stored on the vehicle in on-board batteries: Battery electric vehicle (BEV)
- kinetic energy storage: flywheels
- static energy stored on the vehicle in on-board electric double-layer capacitors

The power of a vehicle's electric motor, as in other vehicles, is measured in kilowatts (kW). 100 kW is roughly equal to 134 horsepower, but electric motors can deliver their maximum torque over a wide RPM range. This means that the performance of a vehicle with a 100 kW electric motor exceeds that of a vehicle with a 100 kW internal combustion engine, which can only deliver its maximum torque within a limited range of engine speed.

We already have the technology we need to cure our addiction to oil, stabilize the climate and maintain our standard of living, all at the same time. By transitioning to sustainable technologies, such as solar and wind power, we can achieve energy independence and stabilize human-induced climate change.

Increasing transportation efficiency is the best place to start efforts to reduce emissions of carbon dioxide (CO_2), which is a primary culprit in global warming. Of all CO_2 emissions in the United States, about 33 percent comes from transportation.

if we switched from gasoline cars to EVs and plug-in hybrids recharged by our existing utility grids (which mostly use fossil fuels), we would see a 42 percent national average reduction in CO_2emissions, according to research by Peter Lilienthal of the National Renewable Energy Laboratory.

- **Vishakha Patil**

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PROBLEMS & REMEDIES

Composite Manufacturing: Defects & Remedies

The future of the composites industry is bright because of the increased demand for lightweight but strong materials across various industries ranging from aerospace and windmills to small consumer goods.

Composites are manufactured by combining fibers and resin systems into a well consolidated system. The fiber and resin may be separate or pre- combined in the form of a prepreg during manufacturing. Defects in composites can occur during manufacturing or during the in- service life of the composite.

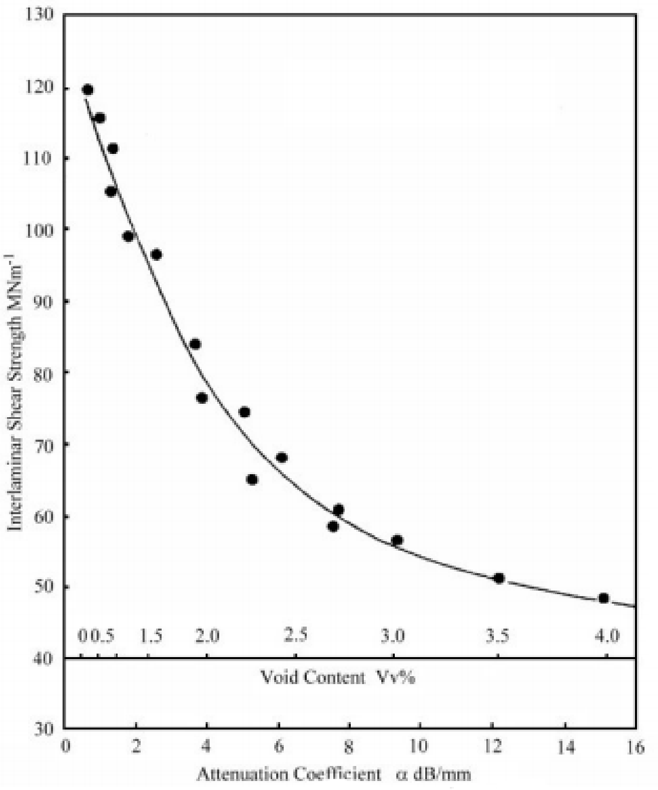

Figure 2. Relationship between Interlaminar Shear Strength and Porosity (Void Content) for Unidirectional HTS Carbon Fibers in an ERLA 4617 Epoxy-resin Matrix. (Source: Stone D. E. W. and Clarke B. (1974). Nondestructive Determination of the Void Content in Carbon Fiber Reinforced Plastics by Measurement of Ultrasonic Attenuation, *RAE Technical Report* 74162)

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Manufacturing defects are inevitable in composite structures. They can be reduced but not totally eliminated. While the defects depend on the manufacturing process, their significance varies with the performance requirements placed on the structure. A good engineering approach is, therefore, to allow defects that would not jeopardize safe performance and in return reduce the manufacturing cost. A number of defect have been identified over the years like Porosity, Foreign bodies, Incorrect fiber volume fraction, Bonding defects, Fiber misalignment, Ply misalignment, Delamination etc. However, the most important manufacturing defect is porosity in the composite- that is, presence of small voids. This void content is an important parameter because of its influence on the inter laminar shear strength. Least void content can only be produced by the Autoclave method. However, the autoclave method is expensive, time consuming and not suitable for extremely large parts. Hence, most aerospace composite manufacturers have now switched to OOA (Out of Autoclave) methods. Various data studies related to various OOA processes all indicate that a range of approximately 2- 4% void content is commonly produced.

Certain OOA processes can achieve the autoclave quality by:

1. Using Reduced viscosity but still toughened resins,
2. Using prepregs and bagging consumables with enhanced air paths,
3. Conducting sufficiently long Room temperature vacuum debulk to remove trapped air
4. Using High pressure to keep dissolved volatiles in the solution until the resin gels.
5. Ensuring there is sufficient time and pressure for the resin to infiltrate any evacuated voids between plies and within the fibre tows.

- **Karishma Prabhu**

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PROFICIENCY TESTING

Scheduled PT Programs

1. Scratch Hardness of Painted Products:

   Test Method: IS 101 Part 5 Sec 2

2. Tensile Strength & Elongation of Rubber:

   Test Method: ASTM D 412 / IS 3400 Part 22

3. Ash Content of Rubber:

   Test Method: ASTM D 297 / IS 3400 Part 22

4. Density of Rubber:

   Test Method: IS 3400 Part 9

5. Shore Hardness of Rubber:

   Test Method: ASTM D 2240

6. Compression Set of Rubber:

   Test Method: ASTM D 395

For more details please contact on +91 90292 90228 / +91 22 27412923 or mail us on ***proficiency.testing@finefinish.net/qm-pt.rmp@finefinish.net /prathamesh.phansekar@finefininsh.net/kishore.prabhu@finefinish.net***

- **Prathamesh Phansekar**

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CERTIFIED REFERENCE MATERIALS

List of Available Certified Reference Materials

1. **Melt Flow Index (PP Granules) (ASTM D 1238)**
2. **Tensile Strength of Composite (ASTM D 3039)**
3. **Density of Plastics (ASTM D 792)**
4. **Tensile Strength (Metals) (ASTM E 8) NEW**
5. **Chemical Composition of Metals by Spectrometer (LAS) (ASTM E 415) NEW**
6. **Tensile Strength of Rubber (ASTM D 412) NEW**
7. **Coal – Proximate Analysis (IS 1350 Part -1) NEW**

The formation of coal from a variety of plant materials via biochemical and geochemical processes is called coalification. The nature of the constituents in coal is related to the degree of coalification, the measurement of which is termed rank. Rank is usually assessed by a series of tests, collectively called the proximate analysis, that determine the moisture content, volatile matter content, ash content, fixed-carbon content, and calorific value of a coal.

Our CRM consists of below parameters of proximate analysis.

Moisture (IS 1350 Part-1)

Moisture content is determined by heating an air-dried coal sample at 105–110 °C (221–230 °F) under specified conditions until a constant weight is obtained. In general, the moisture content increases with decreasing rank and ranges from 1 to 40 percent for the various ranks of coal. The presence of moisture is an important factor in both the storage and the utilization of coals, as it adds unnecessary weight during transportation, reduces the calorific value, and poses some handling problems.

Volatile Matter (IS 1350 Part-1)

Volatile matter is material that is driven off when coal is heated to 950 °C (1,742 °F) in the absence of air under specified conditions. It is measured practically by determining the loss of weight. Consisting of a mixture of gases, low-boiling-point organic compounds that condense into oils upon cooling, and tars, volatile matter increases with decreasing rank. In general, coals with high volatile-matter content ignite easily and are highly reactive in combustion applications.

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ASH (IS 1350 Part-1)

Coal contains a variety of minerals in varying proportions that, when the coal is burned, are transformed into ash. The amount and nature of the ash and its behaviour at high temperatures affect the design and type of ash-handling system employed in coal-utilization plants. At high temperatures, coal ash becomes sticky (i.e., sinters) and eventually forms molten slag. The slag then becomes a hard, crystalline material upon cooling and resolidification. Specific ash-fusion temperatures are determined in the laboratory by observing the temperatures at which successive characteristic stages of fusion occur in a specimen of ash when heated in a furnace under specified conditions. These temperatures are often used as indicators of the clinkering potential of coals during high-temperature processing.

Fixed Carbon (IS 1350 Part-1)

Fixed carbon is the solid combustible residue that remains after a coal particle is heated and the volatile matter is expelled. The fixed-carbon content of a coal is determined by subtracting the percentages of moisture, volatile matter, and ash from a sample. Since gas-solid combustion reactions are slower than gas-gas reactions, a high fixed-carbon content indicates that the coal will require a long combustion time.

For more details please contact on +91 90292 90228 / +91 22 27412923 or mail us on

proficiency.testing@finefinish.net/qm-pt.rmp@finefinish.net /prathamesh.phansekar@finefininsh.net/kishore.prabhu@finefinish.net

- Prathamesh Phansekar

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TRAINING & CONSULTANCY

Forthcoming Training Programs

Sr. No.	Title	Date	Fees	
			Non-residential	Residential
1	Laboratory Management System and Internal Audit as per ISO/IEC 17025:2017	January 07 to 10, 2019	₹. 14,000/-	₹. 21,000/-
2	ISO/IEC 17043:2010	January 21 to 24, 2019	₹. 14,000/-	₹. 21,000/-
3	Rubber Testing : Methods & Result Interpretation	January 28 to 29, 2019	₹. 10,000/-	₹. 13,500/-
4	ISO 15189:2012	February 04 to 07, 2019	₹. 14,000/-	₹. 21,000/-
5	Laboratory Management System and Internal Audit as per ISO/IEC 17025:2017	February 18 to 21, 2019	₹. 14,000/-	₹. 21,000/-
6	SI Brochure	February 25, 2019	₹. 7,000/-	₹. 9,000/-

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CONTACT US

Department	Address	Contact number	Email ID
Manufacturing	Plot No.76, New Chemical Zone, MIDC, Taloja – 410 208, Navi Mumbai, Maharashtra India.	+91 22-27412921; T/Fax: +91 22-27410820/ 2921	info@finefinish.net
DSIR Recognized R&D Centre	Plot No.29, New Chemical Zone, M.I.D.C., Taloja-410 208, Navi Mumbai, Maharashtra, India.	+91 22-27411329; +91 9029422224	karishma.prabhu@finefinish.net
Mechanical/ Chemical/ Electrical Testing	Plot No.29, New Chemical Zone, M.I.D.C., Taloja-410 208, Navi Mumbai, Maharashtra, India.	+91 9029829777	vishakha.patil@finefinish.net; info@finefinish.net
Training & Consultancy	Platinum Properties, Unit B/4, Block No.6, G: 22-24, Part A&B, Opposite Dena Bank, MIDC, Taloja, Navi Mumbai -410208, Maharashtra, India.	+91 9029290228/ 27412923	training@finefinish.net
Proficiency Testing	Platinum Properties, Unit B/4, Block No.6, G: 22-24, Part A&B, Opposite Dena Bank, MIDC, Navi Mumbai, Taloja-410208, Maharashtra, India.	+91 9029290228/ 2741 2923	proficiency.testing@finefinish.net/ kishore.prabhu@finefinish.net
Head Office & Sales	801, Sai Sangam, Sector - 15, CBD Belapur, Navi Mumbai – 400 614, Maharashtra, India.	+91 22-4123 8976, 2757 7349, T/Fax: +91 22- 2756 0249	sales1@finefinish.net

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