Microwave RF Plasma Research and Development

Plasma, the fourth state of matter, is composed of free electrons and charged particles that interact with energy in many forms including thermal, electrical, RF/microwave, photonic, and nuclear. In particular, energized plasma can pass, reflect, or absorb RF energy depending on how it is controlled. The interaction of plasma and RF is useful for a number of military applications:

- HPM/EMP Shielding
- RF Limiter Protection Devices
- Passive RF Detection
- Frequency Selective Surfaces
- Meta-materials
- Tunable Micro-scale Plasma Devices

Harnessing the power of plasma with IST Plasma-shell™ technology

Plasma-shells™ developed by Imaging Systems Technology (IST), are hollow walled shells containing a pressurized gas that can be energized into plasma. Unlike other forms of plasma encapsulation, Plasma-Shell™ technology is inherently rugged and easy to incorporate in many different configurations.

Plasma-shell™ Features:

- Flexible packaging
- Conformable
- Scalable to very large areas
- Low profile (4mm depth)
- Environmentally friendly (no mercury)
- Low cost
- Typical life is 120,000 hours
- Hydrostatic crush strength > 15 Ksi
- Temperature resistant >1000° C

About IST

Imaging Systems Technology has a highly skilled team of RF engineers, chemists, and scientists, engaged in developing the Plasma-shell™ technology for various military and commercial applications. IST has worked alone and in conjunction with military systems integrators to successfully fabricate a number of Plasma-shell™ based RF systems.

IST's 27,000 square foot facility has in-house capability to manufacture Plasma-shells™ and integrate them into two dimensional and three dimensional arrays. IST is ISO 9001 certified. IST is a woman owned small business. IST is a U.S. based company located in Toledo, Ohio in the 9th congressional district.

Plasma-shell™ Technology

Plasma-shells™ are hollow gas encapsulating devices developed by Imaging Systems Technology (IST). When a voltage is applied across the walls of the shell, the encapsulated gas is energized into plasma. The Plasma-shells™ are electronic components that can be used as light emitters, switches, and sensors. Under a sister company, Deep Springs Technology (DST), hollow shells are being introduced into mechanical and structural applications including armor, buoyancy, and heat shielding.

Current Plasma-shell™ Applications

IST is introducing the Plasma-shell™ components into a number of electronic markets including: germicidal, photo curing, lighting, displays, nuclear, and RF. Applications and products are listed below.

Plasma-Switched Frequency Selective Surface (PS-FSS)
Plasma-shell™ switches activate and deactivate electromagnetic aperture with fast response time for HPM/EMP shielding and low observable applications.

RF-Alert™ Sensor
Plasma-shell™ sensors are employed to provide a passive, low cost, RF monitoring system for personal safety. Applied to clothing, gear, or other surfaces, these devices can be used in industrial, military, or scientific settings.

IST Plasma-shell™ Display
Plasma-shell™ pixels are formed into low cost, rugged, large area arrays for use in large area digital signage, simulation, and scene generation.

IST Plasma-shell™ Light Tiles
Plasma-shell™ lighting elements offer a customizable, low profile, ultra rugged light source for decorative, architectural, and industrial applications.

UV Light Source
Plasma-shell™ lighting elements provide large area, homogenous lighting for germicidal, photo-curing, medical treatment, and UV band communication.

FABRICATION CAPABILITIES

Our Plasma-shell™ manufacturing process has many customizable parameters. Tight control over our process allows IST to produce shells to the specification of a wide variety of applications.

Controllable Parameters	Notes
Sizes	IST fabricates shells from 0.5 mm to 10 mm. Other sizes are possible. Typical applications call for sizes of 1- 4 mm
Wall thickness	Wall thickness is controllable. Typical applications call for wall thickness of 5 to 10 percent of shell diameter
Shapes	Practically any shape is poss ble. Typical shapes include cylinders, cubes, oblate spheroids, rectangular prisms, and other complex shapes
Materials	Glass, Metal, Ceramic. Typical materials include Y_2O_3, ZrO, SiO_2, Al_2O_3, maraging steel, carbon steel, and various glasses
Layers	Shells can be fabricated with layered walls
Gas Fill	Inert gas, including mixtures with hydrogen up to 4%
Gas Pressure	0 – 500 Torr
Post Processing Capabilities	Coating, electroding, and application of shells onto substrates

TECHNICAL SUPPORT

IST provides world class customer service to support our cutting edge technology.

QUALITY ASSURANCE

IST is an ISO 9001:2008 certified manufacturer and designer. We constantly strive to improve our processes to ensure the highest quality products and services.

CUSTOM SOLUTIONS

Our team of electrical and mechanical engineers can design and develop the solution that best fits your needs.

CONTACT

For more information on any of our products please visit us on the Web at:

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