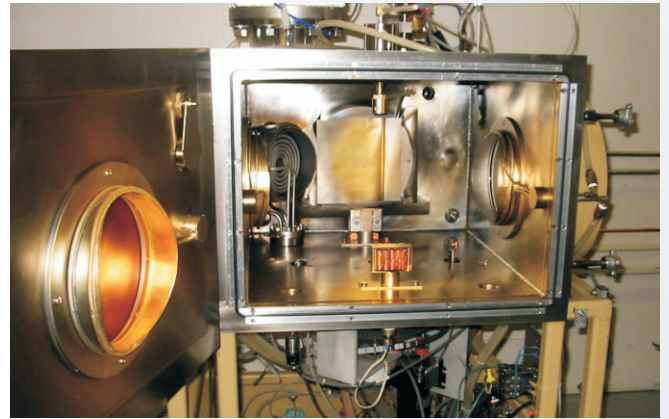


Thin Films and Coatings

Hadron Technologies has more than 25 years experience in creating materials for applications in severe metallurgical environments. That technology base has expanded in the last year to include a variety of coating technologies for graphite crucibles, molds, and components.

Hadron scientists and engineers have applied surface engineering technologies to a wide range of industries including semiconductor, solar, automotive, glass melting, and heavy manufacturing. Benefits of the engineered surfaces include increased wear resistance, corrosion resistance, and chemical compatibility with processing materials.

Recent interest has come from the casting industry, particularly, those that deal with reactive and high value-added materials that need to avoid contamination. Hadron has conducted initial R&D demonstrating a unique capability to coat graphite parts with a range of materials including titanium nitride (TiN).



Techniques Available

Physical Vapor Deposition (PVD)

PVD coatings by RF/DC sputtering are typically on the order of 1-3 microns thick and have extremely high adhesion to their substrate. Films can be directly deposited from a target's chemistry, or reactively produced.

Vacuum Cold Spray (VCS)

VCS is a proprietary process developed by Hadron for the application of thick film coatings (>50 microns) to a wide range of substrates including graphite. The VCS films are diffusion bonded and adhere through multiple thermal cycles.

Microwave-Assisted CVD

Hadron's novel microwave-assisted chemical vapor deposition utilizes microwave energy to decompose a gaseous precursor and deposit films of interest.

Plasma/Thermal Spray

Hadron engineers have worked extensively on the plasma/thermal spray thick film coatings for metals, ceramics, and graphite. These spray techniques are amenable to a wide range of film compositions, depending on the requirement for a particular application.