MEPNN Supplier Scouting Opportunity Synopsis

Section 1: General Information

Scouting Number	2024-267
Item to be Scouted	Boron Doped Diamond
Days to be scouted	25
Response Due By	09/29/2024
Description	Electrode to be used in electrochemistry application.
Notify Requester Immediately	
State item to be used in	Texas

Section 2: Technical Information

Type of supplier being sought	Manufacturer
Reason	New product startup
Describe the manufacturing processes (elaborate to provide as much detail as possible)	Product: Chemical Vapor Deposition (CVD) process to make a solid Boron doped diamond. Application: Electrode in an electrochemical reactor at up to 60V Potentials.
Provide dimensions / size / tolerances / performance specifications for the item	5.125” diameter. 1/64” thickness. Using round material but could consider rectangular.
List required materials needed to make the product, including materials of product components	Natural diamond, boron, Chemical vapor deposition (CVD) process materials. Must be solid, not a coating on a substrate
Are there applicable certification requirements?	No
Are there applicable regulations?	No
Are there any other stndards, requirements, etc.?	No
NAICS 1	335991 Carbon and graphite product manufacturing
NAICS 2	
Additional Technical Comments	

Section 4: Business Information

Estimated potential business volume	Year 1 - 150, Year 2- 600, Year 3 - 2,400
Estimated target price / unit cost information (if unavailable explain)	Open for discussion
When is it needed by?	October, 2024
Describe packaging requirements	Individually wrapped, boxed to prevent damage in shipping.
Where will this item be shipped?	San Antonio, Texas

Additional Comments

Is there other information you would like to include?	

Properties	Value	Comment
Electrochemical properties		
Boron doping concentration (typical)	~ 3 x 10^{20} Atoms cm^{-3}	Averaged over 0.4 mm^2
Resistivity	0.50 x 10^{3} Ohm m	Range is 0.20 - 1.8 x 10^{3} Ohm m
Aqueous solvent window	-2.2 to 2.3 V	0.1 M KNO_3 versus SCE
Typical current density range	1000 A m^{-2} to 20,000 A m^{-2}	
Typical erosion rate	<6 µg h^{-1} m^{-2}	Measured over 200 hours @ 5000 A m^{-2} with 1 M NaCl electrolyte
Mechanical properties		
Nucleation side fracture stress	>800 MPa	Typical thickness in range of 400 to 800 µm
Growth side fracture stress	>450 MPa	Typical thickness in range of 400 to 800 µm
Young's modulus	1050 GPa	
Fracture toughness	8 $MPam^{0.5}$	
Weibull modulus	>10	
Hardness	81 ± 18 GPa	
Thermal properties		
Thermal conductivity	~700 W m^{-1} K^{-1}	@ 300 K
Dimensional tolerance un-processed		
Thickness uniformity	±25%	Typical values
Nucleation side roughness	Ra <0.35 µm	Typical values
Growth face roughness	Ra <200 µm	Typical values
Max area available (round)	13,200 mm^2	Diameter 130 mm
Max area available (rectangle)	7150 mm^2	Rectangle 110 x 65 mm
Lateral dimensional tolerance	±0.20 mm	All edges are laser cut
Processed		
Lapped face roughness	Ra <250 nm	Typical range
Polished face roughness	Ra <30 nm	Typical range
Thickness tolerance	±0.05 mm	Typical range

CVD diamond mechanical, electrochemical:

	Polycrystalline CVD diamond (optical, thermal, electronic)	Polycrystalline CVD diamond (mechanical, electrochemical)
Size thickness	< Φ 100 mm; < 4 mm	< Φ 130 mm; < 2 mm
Dimensional tolerance	-0, + 0.2 mm	-0, + 0.2 mm
Thickness	± 25 µm	± 25 µm
Cut edge Kerf Angle	3°, ± 2°	3°, ± 2°
Surface roughness lapped (Ra)	< 200 nm	< 200 nm
Surface roughness polished (Ra)	< 20 nm	< 20 nm
Flatness (633 nm)	1 fringe in 10 mm	
Orientation miscut		
Facet angle (prisms)		