UNIVERSITY OF MISSISSIPPI

Notice of Intent to Certify Sole Source

SS 287

The University of Mississippi (UM) anticipates purchasing the item(s) listed below as a sole source purchase. Anyone objecting to this purchase as a sole source shall follow the procedures outlined below.

Commodity or commodities to be purchased (manufacturer, model, description):

TA Instruments ARES G2 Rotational Rheometer

The need to be fulfilled by this item(s) and why it is the only one that can meet the specific needs of the department:

The ARES G2 rheometer is the only instrument with the required functionality to measure the rheological properties of the materials generated within our research program. Rheology is the study of flow and deformation of materials. Deformation and flow are referred to as strain or strain rate, respectively, and indicate the distance over which a body moves under the influence of an external force, or stress. For this reason, rheology is also considered to be the study of stress-strain relationships in materials. A rheometer is a precision instrument that contains the material of interest in a geometric configuration, controls the environment around it, and applies and measures wide ranges of stress, strain, and strain rate. Material responses to stress and strain vary from purely viscous to purely elastic to a combination of viscous and elastic behavior, known as viscoelasticity. These behaviors are quantified in material properties such as modulus, viscosity, and elasticity. This instrument will be used for research as part of the Nano-Bio ImmunoEngineering Consortium (NIEC) and is compatible with other characterization instruments used in the labs of Dr. Tanner (chemistry), Dr. Werfel (BME) and Dr. Smith (Ch E). The ARES G2 is the only rheometer on the market that meets all of the requirements for our research, with a dedicated actuator for deformation control, Torque Rebalance Transducer (TRT), and Force Rebalance Transducer (FRT) for independent shear stress and normal stress measurements. It is recognized by the rheological community as the industry standard to which all other rheometer measurements are compared for accuracy. Below are the specific technical requirements necessary for us to conduct our research that this instrument provides: 1) Must utilize separate motor and transducer to independently apply the deformation and measure the torque and force, thus it eliminates the inertia and friction effect from the motor and provides superior amplitude, phase angle and normal force measurements. To prove this, the instrument must demonstrate the capability to measure air viscosity (0.018cp to 0.019cP at room temperature) with 40mm or 50mm Parallel Plate and the gap 0.1mm to 0.5mm in steady shear of rate range from 50 to 5000 1/s, and accurately measure 3cP oil at least up to 100rad/s in oscillation. 2) The transducer must house two separate and independent components to measure torque and normal force respectively using a rebalance mechanism: a Torque

Rebalance Transducer (TRT) and Force Rebalance Transducer (FRT). 3) Must utilize a heavy stiff steel frame to minimize the deformation of the instrument itself. The gap or length measurement must be always corrected by the instrument's compliance. The axial compliance in measuring normal force must be not large than 0.1µm/N. 4) Not only the temperature sensor for lower plate but also the temperature sensor for upper plate must be available in direct contact with both plates with wireless signal transmission to assure uniform and accurate sample temperature 5) Must have ability to test solid materials in dynamic bending or tension/compression modes using 3 Point-bend, Single/Dual Cantilever, Tension, Compression geometries to generate Young Modulus (E', E", and tan delta) over the entire temperature range of the forced convection oven (-150 to 600 °C). 6) Must be able to perform orthogonal superposition (OSP) and 2 dimension small amplitude oscillatory (2D-SAOS) for non-linear and anisotropic behavior of complex fluids. This must be achieved by simultaneously applying deformations in the angular and axial directions. 7) Motor: must be a frictionless brushless DC servo air bearing motor that applies strain, strain rate and stress. · Oscillation amplitude range: 1 µrad to unlimited with 0.04µrad resolution · Frequency range: 1e-7 to 100 Hz with 99.9% accuracy · Rotational rate range: 0-300 rad/s with 99.9% accuracy · Maximum torque: 0.9 N/m · Response time in step strain: 10 ms in 10mrad step size · Response time in step rate: 5 ms in 10 mrad/s step size · Be able to generate any shape of movement not sinusoidal shape only 8) Transducer: must be torque/force rebalance mechanism (non-compliant) to minimize the deformation of the transducer itself. · Torque range: 0.0005 g*cm to 2000 g*cm (50 nN.m to 200 mN.m) with a minimum resolution at least of 5e-5 g*cm (5 nN.m). The torque linearity must be better than 0.1%, with a hysteresis of less than 0.05% of full scale. Transducer's thermal drift effects must be less than 0.002/^{o}C. No mapping and inertia calibration are necessary to achieve the torque range, i.e., achievable torque range does not depend on sample viscosity and test conditions (like frequency and amplitude). · Axial/Normal Force range: 0.01 to 2000 gram (0.001 N to 20 N) with a minimum resolution of at least 5x10-5 N (x10-3 gram). Linearity must be better than 0.5% with a hysteresis of better than 1% full scale. Transducer's thermal drift effects must be less than 0.01 /^{o}C. 9) Stepper motor: A highly precise encode must be used to measure the gap travel independently of the gap control mechanism. · Linear velocity range: 0.0001 to 30 mm/sec with the minimum step of 10 nm. · Travel distance: >150mm 10) Temperature Control System: must be a true forced air convection oven utilizing two heater guns (upper and lower) with counter-rotating air flow to generate highly uniform temperature distribution and stability. · Temperature range: -150 to 600°C with 0.1 °C stability · Maximum heating / cooling rate: 60 °C/min with the ballistic rate more than 300 °C/min · Temperature must be extendable to -150 °C using liquid nitrogen or -100 °C with a mechanical air chiller · The oven must feature a sight-glass port to view the sample, or a camera to monitor the sample in real-time and the image can be displayed and saved in the software. · Upper and lower temperature sensor must be available for upper and lower plates.

Name of company/individual selling the item and why that source is the only possible source that can provide the required item(s):

The ARES G2 is manufactured and sold directly (not through any dealers) by TA Instruments. No other rheometer on the market has the features necessary to conduct our research, specifically a dedicated actuator for deformation control, Torque Rebalance Transducer (TRT), and Force Rebalance Transducer (FRT) for independent shear stress and normal stress measurements.

Why the amount to be expended for the commodity is reasonable:

The amount is reasonable because this instrument is required for our research and is compatible with existing lab equipment.

Efforts that the agency went through to obtain the best possible price for the commodity:

Multiple discussions were held with the sales representative from TA instruments

Submission Instructions and Format of Response from Objecting Parties:

Interested parties who have reason to believe that the item(s) above should not be certified as a sole source should provide information in the following format for UM to use in determining whether or not to proceed with awarding the Sole Source purchase.

1.1 **Interested Party Information**

1.1.1 **Contact Name, Phone Number, Address and email address**

1.1.2 **Company Website URL, if applicable**

1.2 **Objection to Sole Source Certification**

1.2.1 **Interested parties must present specific objections to the Sole Source certification using the criteria listed above.**

1.2.2 **A statement regarding the Interested Party's capabilities as related to this Sole Source Certification Request.**

1.3 **Comments will be accepted at any time prior to Monday, October 17, 2022 at 10:00 am (Central Time) to Katherine Jones at kajones4@olemiss.edu (with Cc: to purchase@olemiss.edu) at The University of Mississippi Procurement Services Department, 164 Jeanette Phillips Drive, PO Box 1848, University, Mississippi 38677. Responses may be delivered by hand, via regular mail, overnight delivery, or e-mail. The envelope or email should reference the sole source number. UM WILL NOT BE RESPONSIBLE FOR DELAYS IN THE DELIVERY OF RESPONSES. It is solely the responsibility of the Interested Parties that responses reach UM on time. Interested Parties may contact Katherine Jones to verify the receipt of their Responses. Responses received after the deadline will be rejected.**

If after a review of the submitted notice and documents, UM determines that the commodity in the proposed sole source request can be provided by another person

or entity, then UM will withdraw the sole source certification and submit the procurement of the commodity to an advertised competitive bid or selection process.

If UM determines after review that there is only one (1) source for the required commodity, then UM will appeal to the Public Procurement Review Board for approval to purchase.