

**Indian Institute of Technology Kanpur**

**Department of Chemical Engineering**

Enquiry No: JKS/CHE/2014-15/Nov/03

Dated: 12-11-2014

Sealed quotations (**separate technical and commercial bid**) are invited by post/courier; for the supply of following system as per the specifications mentioned below along with complete terms and conditions. Party must attach all the related certificates like Agency certificate, Proprietary item certificate (if applicable) etc. Quotation not accompanied with proper certifications will be rejected.

Your offer should reach us on or before December 01, 2014(**Extended Date**) at the following address.

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For any technical clarification, please contact [jayantks@iitk.ac.in](mailto:jayantks@iitk.ac.in)

**Specification of Fully Automatic Video Based Optical Contact Angle Measuring System**

The instrument should be fully automated Video Based system designed on Goniometric Method with Standard Orthogonal Optics for determination of Contact Angle, wetting properties of simple and complex sample structure and it. The instrument should be fully modular to measure the parameters and methods as follows :

- **Static & Dynamic Contact Angle according to Sessile Drop Method**
- **The wetting behavior in solid surface**
- **Advancing and Receding Contact Angle**
- **Surface and Interfacial Tension by Pendant Drop Method**
- **Surface Tension and Interfacial Tension by Lamella Method should be offered as option**

**The instrument should be capable and equipped with the following specification and features :**

Max Sample dimension : 220 x ∞ x 70 mm

Sample Table Dimension : 100 x 100 mm

Sample Stage Movement : Fully automatic, motorized and software controlled in X, Y and Z axis for accurate Sample positioning

Traversing range of sample table : 100 x 100 x 50 mm (in X, Y, Z - Direction)

Electronic positioning accuracy in X, Y, Z – Direction : ± 0.65 μm

Measuring range of the Contact Angle : 0° - 180°

Measuring accuracy of the video system : ± 0.1°

Measuring range for Surface Tension and Interfacial Tensions :  $1 \times 10^{-2}$  to  $2 \times 10^3$  mN/m  
Resolution :  $\pm 0.01$  mN/m

Optics : 6-fold zoom lens (0.7 ... 4.5 magnification) with integrated fine focus ( $\pm 6$  mm)  
and high light transmitting capacity  
Provision for Software controlled intensity should be available with the system

Video system : USB Camera with a resolution of Max. 1024 x 1024 pixels  
Camera Speed : 1200 Images / Sec with full scan ( Not Progressive Scan )  
Field of view : 1.32 x 0.99...8.50 x 6.38 mm  
Image distortion :  $< 0.05\%$

Image Processing System : High-performance image processing system with 132 MBytes/s data transfer rate  
( Compatible to European standard CCIR and US Standard RS – 170 )  
upto 87 images/sec digitizing speed with RS-170

Backlight Illumination : LED Lighting with adjustable intensity without Hysteresis. Provision for  
Software controlled intensity should be available with the system

Dispensing type : Automatic High Precision Direct Dosing system without any tubing through both  
manual and Software Control. Dosing system should be adjustable in vertical and  
Horizontal position.

### **Measuring Method :**

- Sessile and Captive Drop Method
- Tilting Plate Method
- Pendant Drop Method

### **Following Accessories should be offered :**

High precision electronic and Software Controlled Direct Dosing System with one Electronic Syringe, One 500 ml Glass Syringe and needles to generate very accurate volume of the droplet in the range of  $\mu\text{l}$ .

- a. Electrical temperature control unit with both Manual and Software controlled temperature setting in combination with PID temperature controller for measurements at high temperatures upto  $700^\circ\text{C}$ . It should consist of Thermostating chamber with 3 windows made of special optical glass and both Sample Stage and Chamber Hood should be electrically heated with control sensor.  
The specification should be as follows :
  - Temperature range: Room temperature to  $700^\circ\text{C}$ ;  $\pm 0.3$  K
  - Heat up and cool down rate :  $\pm 1$  K/s
- b. Electrowetting platform for measurement of contact angles in an electrical field with specification as follows :
  - Outer Cell Dimensions : 100 x 100 x 30 mm ( L x W x H )
  - Inner Electrode Dimensions: 80 x 80 mm
  - Electrodes with insulating POM polymer coating with 1 mm thickness and 4 mm connection diameter for external voltage supply

- Voltage range : 0...64 kV DC/AC
  - Standard electrode distances : 2, 5, 6, 7, 10, 12 mm by mountable spacer elements
  - Max. discharge field strength : 32 kV/mm according to IEC 60243-1 diameter for external voltage supply
- c. Electronic Tilting base unit which allows motor-driven and software controlled inclination of the full instrument with specification as follows :
- Tilting range : 0...90°; ±0.1°
  - Tilting speed : 0.03...2.8°/s
- d. Environmental Chamber for using with Humidity Controller with provision for Temp. Control through external circulator with temp. ranging from 0°C to 100°C.
- e. Humidity Generator and Controller for the **automated** regulation of the humidity of ambient clean air in temperature controlled measuring chambers. It should be a stand alone generation of dry air without the need of external pressurized gas supply with provision of heated connection gas tube (transfer line) to thermal chamber to avoid condensation. The specification as follows :
- Control : Through Touch Screen Panel
  - Relative humidity control range : 5% .. 90% @ 25°C; 10% .. 85% @ 85°C
  - Relative humidity accuracy : ± 1.8%
  - Temperature range : +5 .. +85°C
  - Dew point range : min. -15°C, max. 85°C
  - Gases : ambient clean air
  - Heated water reservoir : 80 ml
  - Flow rate : Flow rate of 1400 cm<sup>3</sup>/min, constant flow
- f. Optical Standard for Calibration Check

### Windows based Software should be offered for following job :

- a. Main Software to record / store image sequences of the controlled analysis at fast processes controlling of the electronic syringe unit as well as the other electronic accessories.
- b. Video based contact angle measurement and presentation of the static and dynamic contact angle according to the “Sessile & Captive Drop-Method”.
- c. Calculation of surface free energy of solids as well as their components (e.g. dispersiv, polar and hydrogen bond parts, acid and base portions) according to the theories of Wu, Zisman, Owens-Wendt, Extended Fowkes, Schultz 1 + 2, Fowkes, van Oss & Good, and Neumann. Calculation and presentation of Wetting Envelope and Work of Adhesion/Contact Angle Diagrams.
- d. Laplace Young calculation for both Sessile and for Pendant Drops
- e. Statistics and measurement error analysis.

### Following accessories Should be offered as option :

- Needle Heating Device for Electrical Temp. Control Unit with temp. range upto 700°C

- Software and accessories for Calculation, Analysis and Presentation of the surface and interfacial tension based on the analysis of the lamella contour ( Optical bar-/sphere-method )

The instrument must be upgradable in future with Direct Triple Dosing Unit and Standard Multi Dosing System with maximum six dosing syringes.

## **Terms and conditions**

- The party should have installed at least 20 such equipments in India. A detailed list with contact person should be included in the quotation.
- Separate technical and commercial bids are to be submitted.
- Standard comprehensive warranty and support should be for one year.
- Details of Annual Maintenance Contract (AMC) after standard warranty.
- Pre-installation requirements should be clearly specified in the quotation.
- Spares and consumables: A list of spares included with the equipment, sufficient number of rapidly wearing and consumable parts are to be included to cover the guarantee period
- Other necessary spares if not mentioned above.
- Installation: the price should be inclusive of full installation on site with full functionality demonstration.
- Training & Installation at our site should be done free of cost.
- Maximum education discount, if any, should be offered.
- Quotation should be valid for 60 days.
- Quotation should also carry certificates such as agency certificate, proprietary certificate, patent if any etc.
- All envelopes should be marked with enquiry number.
- Indian quotes should be in Indian Rupees (INR) on FOR destination basis. Foreign supplier needs to quote on CIF basis.
- Financial bid of the technically qualified vendor will be opened only after successful demonstration if institute wish to do so.