

Institute of Metallurgy and Materials Science
Polish Academy of Sciences
25 Reymonta street, 30-059 Krakow
The web page: www.imim.pl
e-mail: przetargi@imim.pl
sign of the case: **ZO/04/2016**

INVITATION FOR OFFERS SUBMISSION FOR AN EXTERNAL SERVICE

FOR: Deposition of wrinkled DLC and Si-DLC thin films on PU and PEEK foils

I. CONTRACTING AUTHORITY

Institute of Metallurgy and Materials Science
Polish Academy of Sciences
25 Reymonta street, 30-059 Krakow
tax identification number : PL 675-000-18-57, REGON: 000326374

II. DESCRIPTION OF THE CONTRACT SUBJECT

Requirements for material:

Monolayer coatings development and elaboration that generate strong participation of residual stresses. The coatings must be prepared on the polymer substrates PEEK and PU using plasma-based deposition technique. Substrates will be delivered by the customer. Elaboration of the surface topography in the form of nano-wrinkles must be generated by high-energetic particles deposited on a soft surface. The coatings must be free from cracks or delamination from the substrate. Additionally, on the surface microwrinkles must be generated. Microwrinkles must be obtained by depositing coatings of high on a soft surface, subjected to slight deformation according to attached theoretical calculations. Dedicated frame for keeping the substrate in a deformed state during the deposition process will be provided by the customer.

- The total thickness of the coating must be up to 500 nm. 2 different coating thicknesses of both DLC and Si-DLC are demanded, resulting by different pre-stretching for wrinkling in 12 material types on PU and 12 on PEEK substrates (see list below). Similar coatings on non-stretched PU, PEEK and Si (totally 4 different coatings) are further necessary . The total amount of coated samples (for all planned characterization tasks) is for each substrate material, PEEK and PU, 40 pcs. 2x10 cm² and 5 pcs. 1.5x10 cm² polymer foils.

Theoretical calculation (attachment to “Requirements for the materials”)

Results calculated according literature model

$$\text{wavelength } \lambda_{\text{ww}}(h) := 2 \cdot 3.14 \cdot h \cdot \left(\frac{E_f}{3 \cdot E_s} \right)^{0.33}$$

$$\text{Critical elongation to wave surface } \epsilon_{\text{ec}} := 0.25 \cdot \left(\frac{3 \cdot E_s}{E_f} \right)^{\frac{2}{3}}$$

Amplitude of the wavelength $\underline{\underline{L}}(h, ed) := h \cdot \sqrt{\frac{ed}{ec} - 1}$

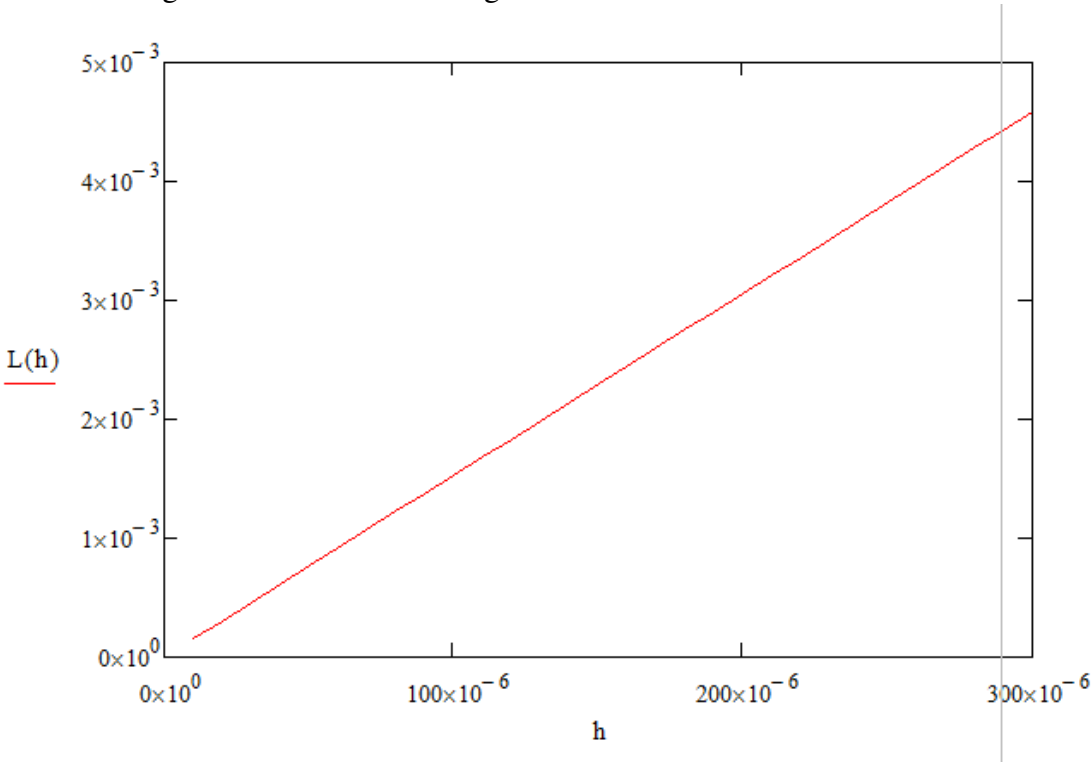
Two polymeric substrates

PU - elasticity modulus $E=0,5\text{GPa}$

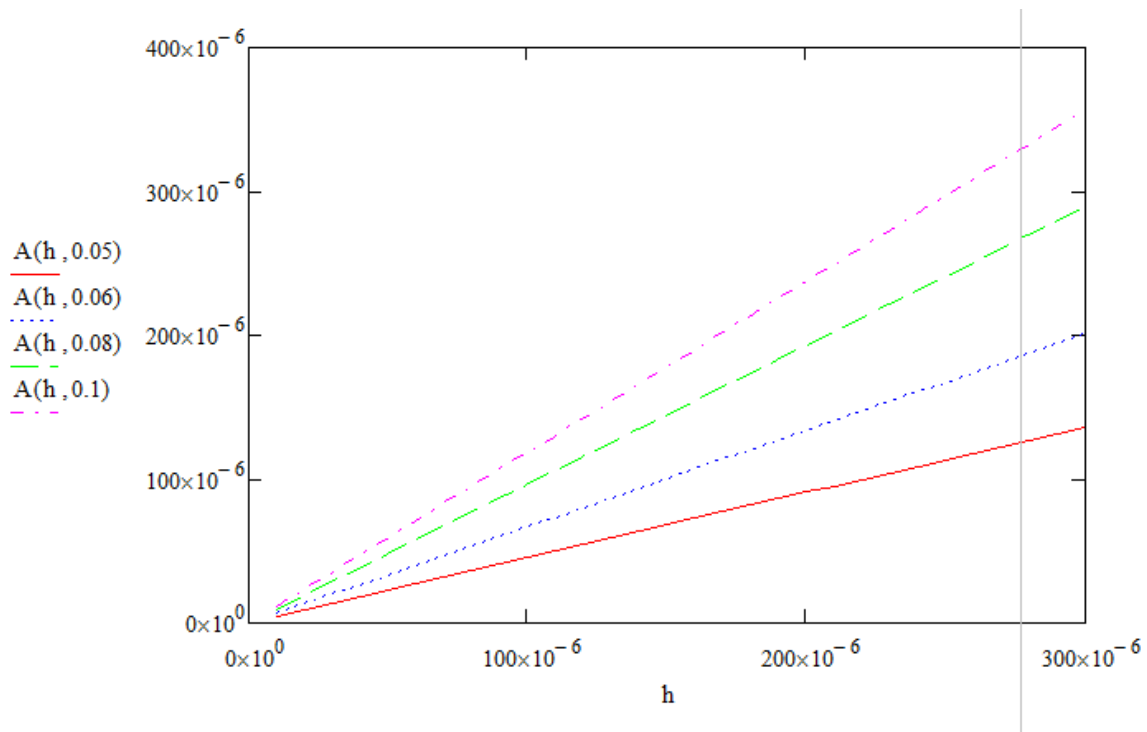
PEEK - elasticity modulus $E=3,6\text{GPa}$

a) coating Si/DLC on PEEK

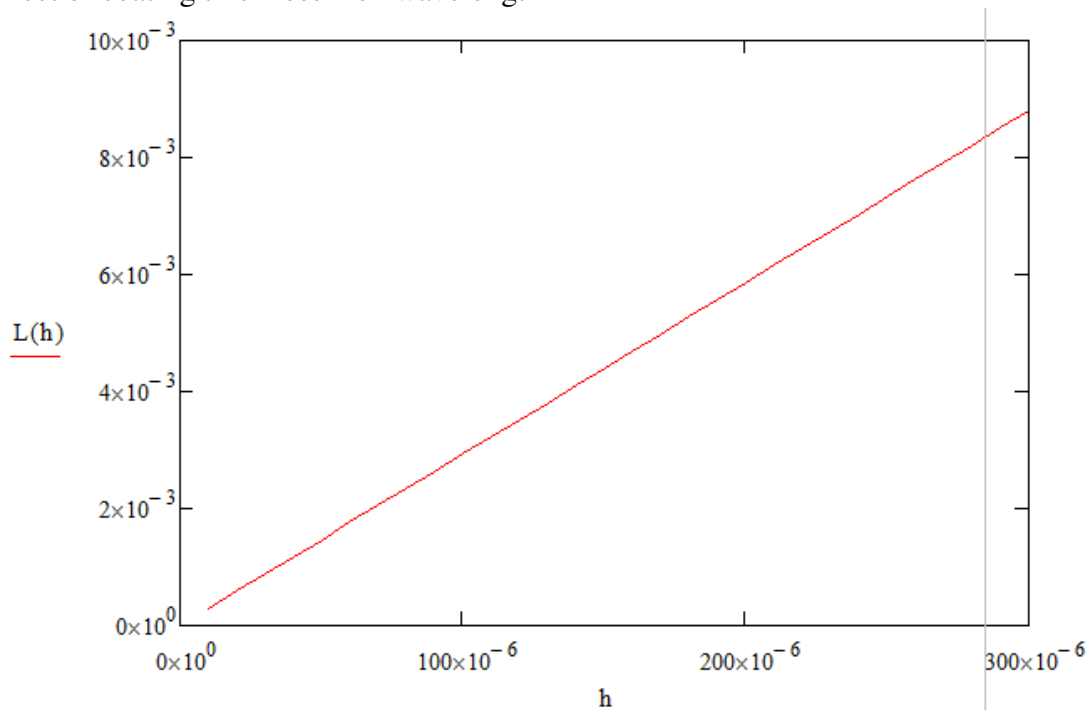
Effect of coating thickness h on wavelength L



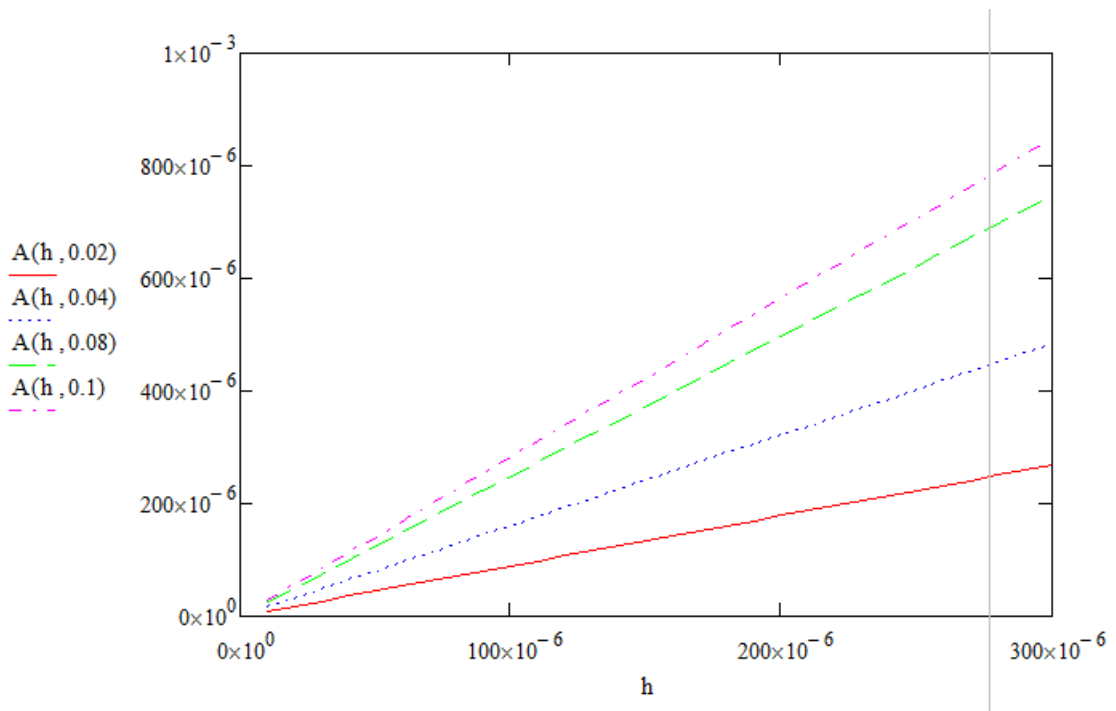
Effect of coating thickness on wavelength amplitude at initial elongation 5, 6, 8 i 10%



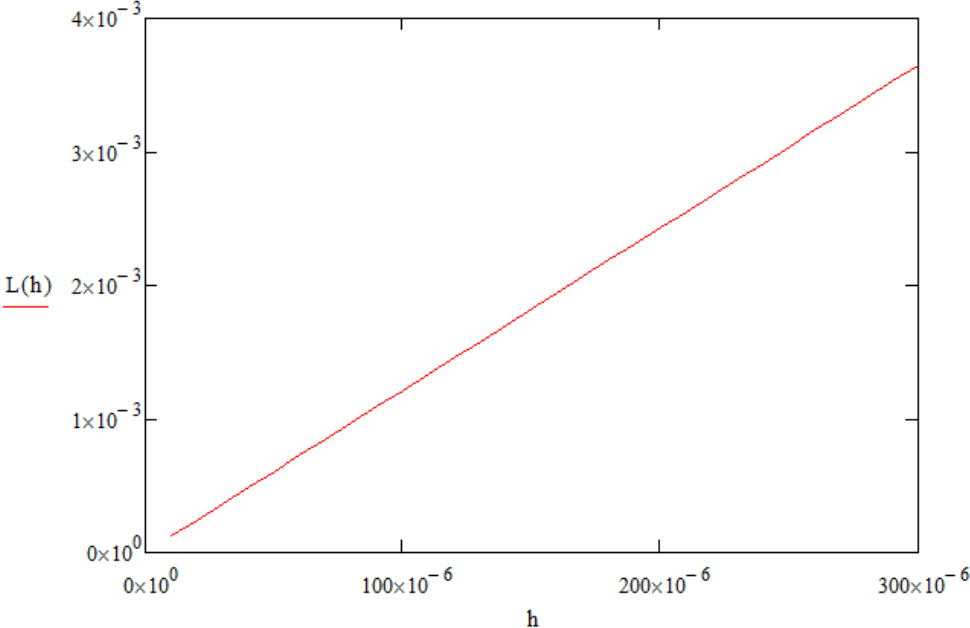
b) coating Si/DLC on PU
 Effect of coating thickness h on wavelength L



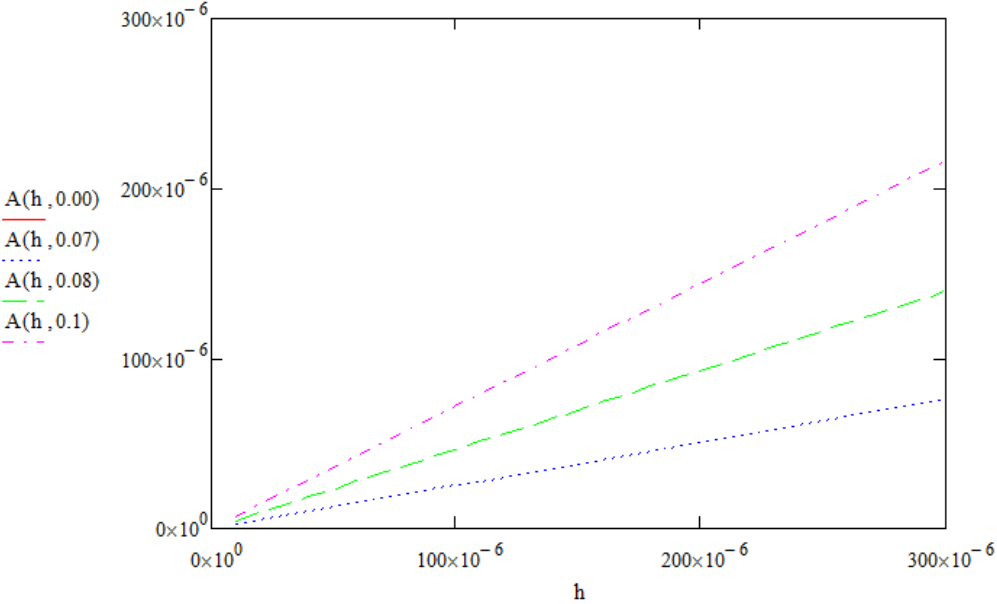
Effect of coating thickness on wavelength amplitude at initial elongation 2, 4, 8 i 10%



c) coating DLC on PEEK
Effect of coating thickness h on wavelength L

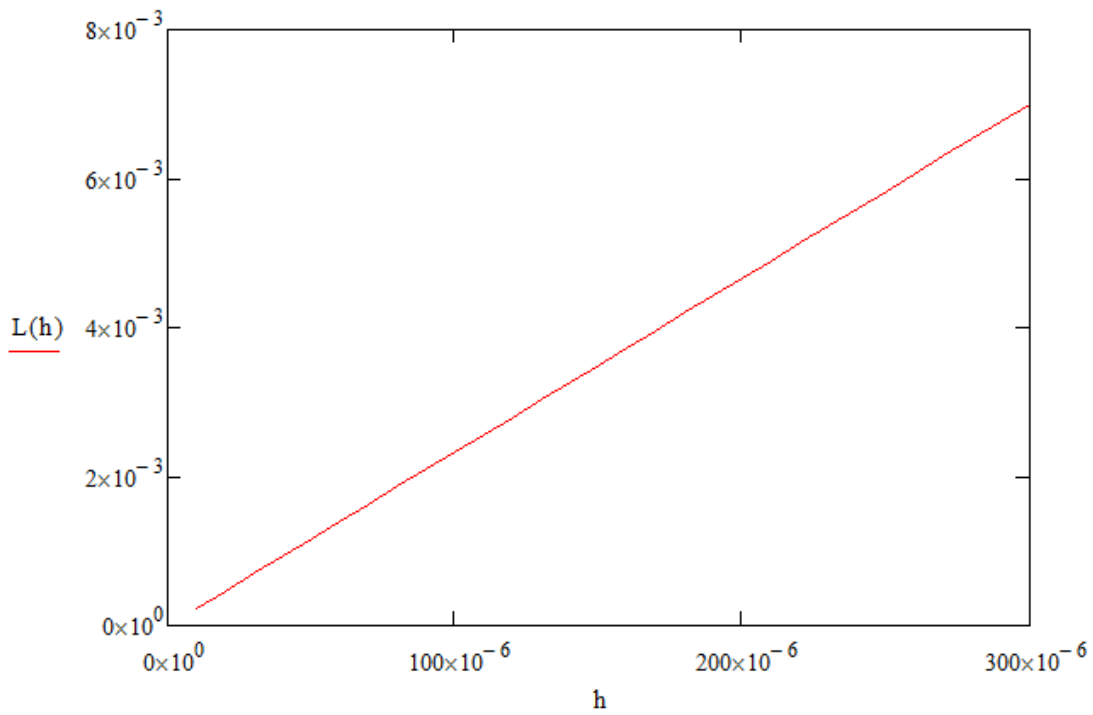


Effect of coating thickness on wavelength amplitude at initial elongation 7, 8 i 10%

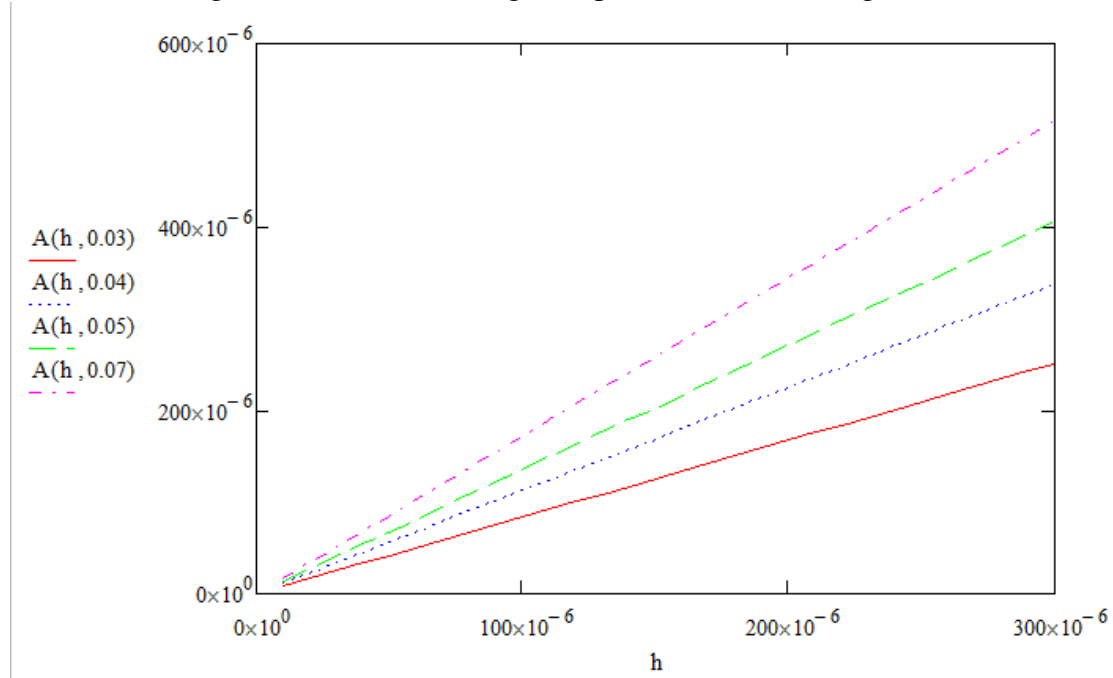


d) coating DLC on PU

Effect of coating thickness h on wavelength L



Effect of coating thickness on wavelength amplitude at initial elongation 3, 4 5 i 7%



Thereon, we define the requirements of the coatings (Amplitude A(h), Wavelength L(h), Coating thickness h are given with $\pm 5\%$ accuracy):

Coating type	Substrate	Coating thickness h (nm)	Wavelength L(h) (μm)	Elongation (%)	Amplitude A(h) (nm)
Si/DLC	PEEK	70	1	5	35
				6	52
				10	90
		175	2.5	5	80
				6	115
				10	210
	PU	70	2	2	55
				4	110
				10	200
		175	5	2	160
				4	280
				10	500
DLC	PEEK	85	1	7	25
				8	40
				10	65
		220	2.5	7	55
				8	100
				10	160
	PU	85	2	3	70
				4	90
				7	140
		220	5	3	180
				4	240
				7	380

Requirements for deposition technique:

- Deposition must be done using plasma- activated chemical vapor deposition (PACVD) technique.

Requirements for the company:

- High experience in vacuum coating process development (plasma-activated chemical vapor deposition, physical vapor deposition) - Please attach minimum 5 international publications
- Experience in development and research on multi-layered materials- Please attach the ISO certification which will prove the quality of service,
- The Institute requests for the current copy from the register or from the central records and information about the business activity, issued no earlier than six months before the deadline for the receipt of requests to participate in the proceedings or the award of tenders.

III. ORDERING PARTY DOES NOT ACCEPT SUBMISSION OF PARTIAL OFFERS.

IV. DEADLINE OF THE SERVICE

The order must be processed within: 30. May 2016

V. THE DESCRIPTION OF THE METHODE HOW TO PREPARE THE OFFER

The offer should:

contain the address or headquarters of the tenderer, e-mail address, telephone number, tax identification number, REGON, KRS, determine the price for the service, price for service

VI. DATE AND PLACE FOR OFFERS SUBMISSION

1. The offer should be sent via: e-mail to the following address: przetargi@imim.pl, or by fax: + 48 12 295-28-04 until 24.02.2016 until 12:00.
2. Offers submitted after the deadline will not be considered.
3. The tenderer may change or withdraw the offer prior to the deadline.
4. During the examination and evaluation of offers The Contracting Authority may request explanations concerning the content of submitted offers from Tenderers.

VII. OFFERS EVALUATION

The Contracting Authority will evaluate the offers bases on the following criteria:

No:	criterion:	Weight:
1	Price (expense)	100%

Points will be calculated according to the following formula:

No of criterion.	Formula
1	Price (expense) Number of points $C_1 = (C \text{ min} / C \text{ bad})$ where: - C bad – gross price stated in the offer - C min – the lowest gross price of all of offers

VII. ADDITIONAL INFORMATION

For more information please contact MsC Marek Pac by calling 12 295-28-45, by e-mail: przetargi@imim.pl

IX. ATTACHMENTS TO OFFERS:

Appendix 1 - Offer Form

X. IT IS OBLIGATORY TO ATTACH TO THE OFFER:

1. Appendix 1 - Offer Form

2. Please attach minimum 5 international publications,
3. Please attach the ISO certification which will prove the quality of service,
4. Please attach the register.

OFFERS FORM

NAME OF THE CONTRACTOR:.....

ADDRESS:

TEL./FAX/ E-MAIL

TAX IDENTIFICATION NUMBER.....

REGON

BANK /ACCOUNT NUMBER

To: **Institute of Metallurgy and Materials Science**
Polish Academy of Sciences
25 Reymonta street, 30-059 Krakow

By joining the procedure for a public contract, the object of which is: deposition of wrinkled DLC and Si-DLC thin films on PU and PEEK foils, I offer the contract realization in accordance with the principles set out in the offer inquiry

Net price:**PLN**

Gross price**PLN,**

in words: **PLN,**

This price includes tax in the amount of..... % ie..... PLN

Place,, date

.....
*signature of the person / persons authorized
to represent the contractor*