Postdoc job description for participants in the “Open Doors: Russian Scholarship Project”

UNIVERSITY	MOSCOW POLYTECHNIC UNIVERSITY (Moscow Polytech)
Scientific Research Project (SRP)	Modeling of thermal and deformation processes of silicon membranes in micro bolometric devices
Department	Scientific and Technical Center “Optoelectronics” at Moscow Polytech
Department Head	Vladimir K. Nikolayev, Candidate of Economic Sciences, Senior Researcher
SRP Research Supervisor	Arkadiy A. Skvortsov, Doctor of Physical and Mathematical Sciences, Professor, Leading Researcher of STC “Optoelectronics
Language	English, Russian

About postdoc research position

Term of engagement	1-3 years
Salary	150 000 roubles (including Personal Income Tax)
Requirements to applicants	The desire and commitment to work
Expected results	After the first year of project implementation: 3 publications in journals Q1 of the Scopus database, as well as submission of application for a grant within the framework of the international competition of the Russian Science Foundation

Tasks and functions in SRP

Work plan for the first year of the project:

- Analysis of scientific and technical literature in pursue of new solutions on feasible structural approaches and results of the stress-strain state of the sensing element and microbolometric matrices upon the whole;
- Preparation of an experimental setup, development of experimental techniques for measuring the heat-conducting properties of multilayer thin-film structures of the type (SiO2-Si, Al-Si3N4-Si, Al-aSi-Si, Al-Si). The technique is based on pulse current heating of metallized surface area and subsequent control of surface temperature dynamics by electrical response. The power of rectangular current pulses will allow us to consider heat stroke, including degradation processes both in metal and in dielectric thin films on silicon substrate;
- Development of a technique for determining the temperature dependences of heat conductivity of thin (not more 150nm thickness) films SiO2, Si3N4, amorphous Si and experimental determination of thermal conductivity coefficients for films of different thickness and temperature;
- Investigation of temperature gradients on geometric inhomogeneities of thin-film structures (bends of metallization systems, steps and kinks of SiO2,Si3N4 thin films, the presence of sublayers) and identification of the main mechanisms of thermal degradation of the structures under consideration;
- Experimental studies of structures using optical, electronic and atomic-force microscopy and analysis of defect formation in silicon near the analyzed structures;
- Building 3D models of sensitive elements and modeling by the finite element analysis of the temperature distribution of stress-strain state and structure (for the membrane size 50×50 microns), establishing the dependence of thermal resistance between the sensitive element and the substrate.