HOMOGENIZATION OF NONLINEAR EQUATIONS IN PERFORATED DOMAIN WITH CENTERED FOURIER BOUNDARY CONDITION

Andrey Piatnitski

Department of Mathematics and Computer Sciences, Narvik University College, Norway

[andrey@sci.lebedev.ru]

2000 Mathematics Subject Classification. 35B27, 74Q05

Keywords and phrases. Γ-convergence, perforated domain, non-linear homogenization.

The talk will focus on two closely related problems. The first one is the Γ-convergence problem for a functional of the form

$$\mathcal{E}^\varepsilon(u) = \int_{\Omega_\varepsilon} f\big(\tfrac{x}{\varepsilon}, Du\big)dx + \int_{S_\varepsilon} g\big(\tfrac{x}{\varepsilon}, u\big)\,d\sigma$$

defined in a periodically perforated domain Ω_ε in $\mathbb{R}^d$, $d \geq 2$; ε being a small positive parameter. It is assumed that $f(y,\xi)$ and $g(y,z)$ are periodic in y variable. Under convexity and p-growth conditions for f and crucial centering conditions for g we construct the homogenized functional, prove Γ-convergence result and study the properties of the limit functional.

In the second part of the talk we consider the homogenization problem for a fully non-linear parabolic equation stated in a periodically perforated domain, of the form

$$\begin{cases} \partial_t u^\varepsilon - \operatorname{div} a(Du^\varepsilon, x/\varepsilon) = f \quad \text{in } \Omega_\varepsilon \times \{t > 0\}, \quad u^\varepsilon = u_0 \quad \text{for } t = 0, \\ a(Du^\varepsilon, x/\varepsilon)\cdot\nu = 0 \quad \text{on } \partial\Omega, \quad a(Du^\varepsilon, x/\varepsilon)\cdot\nu = g(u^\varepsilon, x/\varepsilon) \quad \text{on } S_\varepsilon; \end{cases}$$

here S_ε is the perforation boundary. Assuming periodicity, ellipticity conditions, and centering condition for g, we prove homogenization result and study the properties of the homogenized problem.