Applied Mathematics

CRM-McGill Applied Mathematics Seminar

Sep. 25, 2006, 2:35 pm Monday
At McGill, Burnside Hall 1205

"Discrete Network Approximation for Highly Packed Particle Filled Composites "

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Coffee and refreshments will be served after the seminar

Abstract: We present a new approach for calculation of effective properties of high contrast disordred composites an illustrate it by considering highly packed suspensions of rigid particles in a Newtonian fluid. The main idea of this variational approach is a reduction of the original continuum problem, which is described by PDEs with rough coefficients, to discrete random network. This reduction is done in two steps which con- stitute the "fictitious fluid" approach. In Step 1 we introduce a "fictitious fluid" continuum problem when fluid flows only in narrow channels between closely spaced particles, which reflects physical fact that the dominant con- tribution to the dissipation rate comes from these channels. In Step 2 we derive a discrete network approximation for the latter continuum problem. Next we use this approach to calculate the effective viscous dissipation rate in a 2D model of a suspension (a thin film). We show that that under certain conditions the model exhibits an anomalously strong rate of blow up when the concentration of particles tends to maximal. We explore physical ramification of this phenomenon. The work was done jointly with Y. Gorb and A. Novikov.