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Carbon-based nanostructures at high pressure – towards synthesis of new functional materials

September 18 | Bldg. 101
Wednesday, 4 PM | Seminar Room on the 1st floor

Abstract: Nanostructured carbon is in focus of modern materials research since the fullerene discovery in 1985 followed by synthesis of other molecular forms of carbon – nanotubes and graphene - due to combination of outstanding properties they exhibit: ultra-high hardness and strength, very high current density limits and charge carrier mobility, transparency and exceptional light emitting characteristics, to name just a few. Intermolecular interaction in these systems is governed by weak van der Waals forces thus high is a suitable parameter to tune their physical properties and to create new carbon-based nanostructured materials. In this talk we review our recent results on high pressure studies of fullerene-based compounds, carbon nanotubes and graphene: from fullerene polymers crushed at high p , T to form a superhard nanoclustered graphene phase exhibiting high elasticity through carbon nanotubes squeezed to 1 MBar in a DAC and shocked at 0.5-1 MBar to probe their structural integrity to free-standing (unsupported!) single-layer graphene at high hydrostatic pressure.

References:

- [1] A. Soldatov, *et. al.*, **Science** 293, 683 (2001)
- [2] A.N. Pasupathy, *et.al.*, **Nano Letters** 5, 203 (2005)
- [3] O. Chernogorova, *et. al.*, **Applied Physics Letters** 104, 043110 (2014)
- [4] S. Zhang, *et al.*, **Nature Materials**, under review

Dr. Alex Soldatov is a Full Professor at Luleå university of technology, Sweden and an Adjunct professor/visiting staff scientist at HPSTAR, Shanghai. He received his PhD in low temperature physics from the Institute for Low Temperature Physics & Engineering, Ukraine in 1995. Prof. Soldatov focuses his research on synthesis of **novel** carbon-based materials from nanostructured precursors (fullerenes, nanotubes, graphene) using high pressure and high temperature. He is recipient of Shubnikov Prize for research on thermal properties of Hydrogens and low temperatures. His publication record includes Science, Nano Letters, Nanoscale, PRL, PRB, etc. Prof. Soldatov served several times as European High Pressure Research Group Committee member and since 2015 he is elected member of the Executive Committee of the AIRAPT, The International Association for the Advancement of High Pressure Science and Technology. He is a member of the Swedish Universities Advisory Group on MAX IV Synchrotron Radiation Facility in Sweden.

You are cordially invited to attend!

Special Guest Seminar