CARL VON OSSIETZKY universität OLDENBURG
Institut für PHYSIK

P H Y S I K A L I S C H E S K O L L O Q U I U M
E I N L A D U N G

18.10.2010/Wh

Am Montag, dem 25.10.2010, 16.15 Uhr in W2-1-148

spricht

Prof. Dr. Pablo Esquinazi
Institut für Experimentelle Physik II
Universität Leipzig

über

Is Graphite the best Graphene?
New knowledge on its intrinsic carrier density and mobility

The experimental research of the last years on the properties of a single graphite layer dubbed graphene suggests that one may achieve the basis for new nanodevices. There are several experiments showing nowadays carrier mobilities that do not reach values above ~10 $m^2V^{-1}s^{-1}$ or carrier concentrations below ~10^{10} cm^{-2} in graphene on substrates, grown on SiC or suspended. How are those values in comparison with graphite? Though graphite was studied systematically in the last ~60 years and scientists flooded the literature with reports on different kinds of electronic measurements, there was actually no real knowledge on the extraordinary sensitivity of the graphite structure to defects and their influence in transport. Recently done transport measurements in bulk oriented as well as mesoscopic, thin graphite samples with micro-constrictions indicate a mobility per graphene layer up to 100 times larger (several micrometers long carrier mean free path) and carrier concentrations at least ten times smaller than the lowest measured in graphene, even at low temperatures. Furthermore, proton irradiation experiments on mesoscopic graphite samples provide clear evidence for the relationship between defects and carrier concentration, in very good agreement with theoretical expectations. This new knowledge casts strong doubts on the relevance of the electronic band-structures and their tight binding parameters obtained in the past based on erroneous assumptions on the intrinsic properties of ideal graphite. In my talk I will shortly review and discuss old and new experimental evidence and argue that nowadays graphite appears to be a multi-layer system with nearly decoupled two-dimensional graphene planes of much better “quality” than single isolated layers.

Einladender: Jürgen Parisi