Koops-GranMat, a Bose-Einstein Condensate material working at room temperature being capable to replace superconductors in many applications.

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Abstract
Giant current density is observed at room temperature in Koops-GranMat with Pt- or Au-nanocrystals embedded in a fullerene matrix, see figure 1[i,ii,iii]. The material is built with Focused Electron Beam Induced Processing. A field emission current up to 1mA was observed at 23 V (Au/C) or 70 V (Pt/C). From an emission site of 10 nm in diameter, the current density reaches in both cases > 1.5 GA/cm². In 2009 Koops explained the apparent electron-conduction with excitonic electron states in crystal surface orbitals which obey the Bohr Eigenvalue conditions for energy states. The electrons in these excitonic surface orbitals states have a wavelength λ of 2 nm. The excited excitonic states having a perimeter length of 5 λ overlap and a Bose Einstein Condensate is formed. Here electrons and holes having parallel spins form Bosons, occupy one level only, and show coherent electron emission. Mapping the system on a Bose-Hubbard phase-diagram suggests super-fluidity. The estimated critical temperature for Bose-Einstein-Condensation, see figure 2 is higher than room temperature[iv]. Electrons from the gold connectors occupy at room temperature higher energy levels due to Maxwell temperature distribution and can tunnel directly into the excitonic condensate energy level. The energy difference between the levels level s is for Pt/C 125 meV, which allows the material to serve as a sensitive photo detector for X, Vis and IR.

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[i] H.W.P. Koops , H Fukuda Conference publication to ICNT2014 submitted to JVSTB-A-14, Koops –GranMat ®- Name protection in EU, April 2014

[ii] H.W.P. Koops, J. Kretz, M. Rudolph, M. Weber" Constructive 3-dimensional Lithography with Electron Beam Induced Deposition for

Quantum Effect Devices " J. Vac. Sci. Technol. B 11(6) Nov, Dec (1993) 2386-2389.

[iii] F. Floreani, H.W. Koops, W. Elsäßer Concept of a miniaturised free-electron laser with field mission source Nuclear Instruments and Methods in Physics Research A 483 (2002) 488-492

[iv] L. V. Butov et al. , Nature 417, 47-52 (2002). 2 Byrnes, T., Horikiri, T., Ishida, N. & Yamamoto, Y. BCS Wave-Function Approach to the BEC-BCS Crossover of Exciton-Polariton Condensates. Phys. Rev. Lett. 105, 186402 (2010). Remeika, M. et al. Two-dimensional electrostatic lattices for indirect excitations. Appl. Phys. Lett. 100, 061103 (2012).

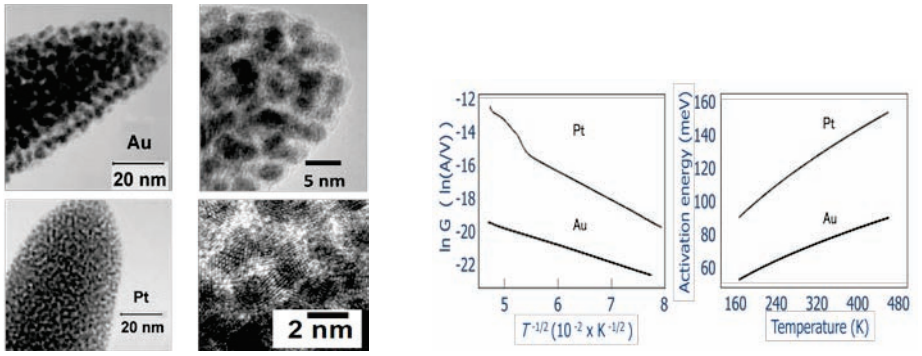

Fig. 1: Left: top: Di-Methyl Gold Trifluoro Acetylacetonate, Left Bottom: Cyclopentadienyle Pt – tri-Methyl. Right: Temperature dependence left: Conductivity, right: Hopping activation energy (Pt/C:125meV, Au/C 60 meV)

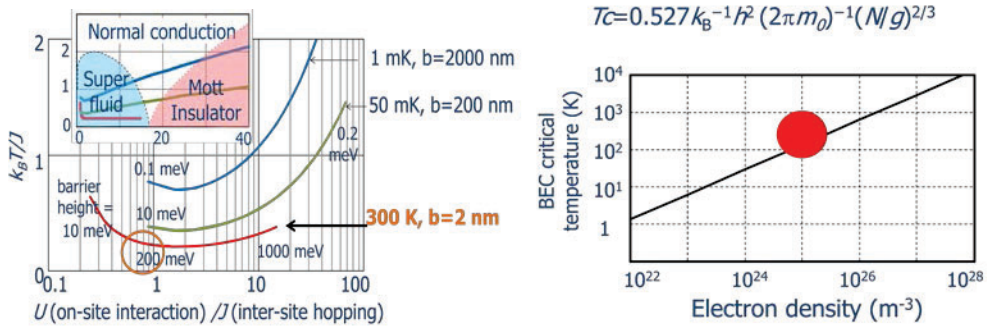

Fig. 2 : Left: Current system mapped on super-fluid phase in Bose-Hubbard model (one exciton per site), Right: Critical temperature for BEC **~ RT** because of high density N and small mass of electron