Why ultrahigh quality plays significant role in carbon supports preparation of TEM grid and TEM imaging.

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The 2017 Nobel Prize in cryo-Transmitted Electron Microscopy highlighted the significance of direct observation of molecular world of the cell. Understanding the structure of biomolecules as well as their changes over cell processes plays an important role in curing diseases and in drug discovery. Both ambient and cryo-TEM require correct and precise sample preparation, in which the quality of carbon support film for sample application is essential.

Carbon films must be transparent to an electron beam, conductive and easy to produce, free from contamination, smooth and strong, and most of all, they should be prepared thin enough to not attenuate the contrast when imaging specimen structural elements. Commercially available TEM grids come in different versions- they can be neat (made of metal: Cu, Ni, Au), covered with polymer film and/or holey(lacey) carbon.

In TEM imaging the support layer has to be as thin as possible due to the fact that the thickness and density of its material influences image resolution and contrast. Another advantage of using carbon is that, its surface properties can be altered in processes like glow discharge, UV irradiation or chemical treatment. This gives a way to overcome problems caused by different affinities of molecules to carbon. Sample preparation for TEM imaging consists of a few steps, and in each of them care has to be taken to achieve desired result. The choice of carbon film thickness, the grid itself, the method of transferring and post-treatment for achieving desired surface properties and finally application of the sample makes the whole process very prone to failure. From one side, the correct execution at each step is curtail and from the other, the quality of the carbon film used for the preparation has tremendous influence on the final imaging.