

Electron Diffraction – The Swiss Knife Among the Analytical Equipment for Solid State Characterization for Pharmaceuticals

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In 1928, a milestone experiment by Devisson and Germer [1] showed that diffraction of electrons acts like waves, corroborating the theories of quantum mechanics. Almost one hundred years later, this very phenomenon can be exploited to get unprecedented answers to nanoscopic questions using a dedicated Electron Diffractometer. Electron Diffraction is now taking up momentum for crystal structure elucidation on materials which cannot be crystallized in large particles, as required for single crystal X-ray diffraction.

In 2018 Smeets et al.[2] introduced serial electron crystallography for structure and phase analysis of nanocrystalline materials. The downside of using a TEM device is that you cannot fully analyze all particles on the sample grid due to the design of the sample stage or goniometer. Recently a dedicated electron diffractometer came on the market which is not based on a TEM device but principally developed for electron diffraction. With the ease of use of these devices in combination with the unique goniometer design you are now able to automatically characterize nanocrystalline materials on the full sample grid.

This opens new innovative applications for people working in the industry and academic world for applications like impurity profiling, detecting micro crystallinity in amorphous materials, assisted solid state screening, which no other technology can do at this moment as swift and accurate. It shows that electron diffraction on a dedicated device is the Swiss knife see Fig 1 for solid state characterization, with respect to broadest range of applications.

This contribution aims to offer different case studies to show these new applications using electron diffraction for people working in the pharmaceutical and related industry or academia.



Figure