

Advantage of Cc/Cs corrected LV-TEM for organic molecular imaging

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The spatial resolution of transmission electron microscopes have been much improved with the development of spherical aberration corrector. However, the observable resolution of electron sensitive materials, such as organic molecular crystals, is not only determined by the instrumental resolution but is often severely restricted due to the interaction of the electron beam with the sample which may result in fast degradation of the structure. We have already reported atomic scale imaging of an organic molecular crystal by Cs-corrected 200kV-HRTEM. Although atomic columnar images of such material were obtained under optimal low-dose and defocus (Scherzer's defocus) conditions, the degradation of image contrast is fatal for such electron-sensitive materials and, moreover, the phase contrast of each organic molecular column is quite low at these accelerating voltages. Therefore, it had been necessary to apply image processing to raw images of such materials, in order to get an image of the atomic columns. In this study, we inspected the validity of the newly developed Cc/Cs corrected low voltage TEM (LV-TEM) [1,2] for high-resolution imaging of soft materials operating at 80kV.

Epitaxial thin film of perchloro-copper-phthalocyanine (CuPcCl₁₆) was employed as a target material. Very thin areas of the CuPcCl₁₆ crystal were observed under low-dose condition (760 e⁻/Å²). Image contrast and resolution in this raw image are extremely improved, compared with only-Cs corrected imaging. We demonstrate that the noticeable improvement in image contrast is also advantageous for the focusing process at extremely low-dose condition.

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[3] www.salve-project.de