



Cryogenic transmission electron microscopy for materials research

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Summary

Cryogenic transmission electron microscopy is simply transmission electron microscopy conducted on specimens that are cooled in the microscope. The target temperature of the specimen might range from just below ambient temperature to less than 4 K. In general, as the temperature decreases, cost increases, especially below -77°C when liquid He is required. We have two reasons for wanting to cool the specimen—improving stability of the material or observing a material whose properties change at lower temperatures. Both types of study have a long history. The cause of excitement in this field today is that we have a perfect storm of research activity—electron microscopes are almost stable with minimal drift (we can correct what drift there is), we can prepare specimens from the bulk or build them up, we have spherical-aberration-corrected lenses and monochromated beams, we have direct-electron-detector cameras, and computers are becoming powerful enough to handle all the data we produce.

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