

## W0198

**Diffraction Symmetry and Structure Determination of Carbon Nanotubes.** Lu-Chang Qin, Zejian Liu, Dept. of Physics and Astronomy, Univ. of North Carolina at Chapel Hill, Chapel Hill, NC 27599.

We have examined the symmetry of electron diffraction from carbon nanotubes, both single-walled and multiwalled, from the analytic expressions of the electron scattering amplitude. Our analysis shows that, for single-walled carbon nanotubes, the electron diffraction patterns will always have 2mm symmetry even if the nanotubes themselves may not have such symmetry. On the other hand, the symmetry of electron diffraction patterns of multiwalled carbon nanotubes may not necessarily always have 2mm symmetry due to the possible coherent interferences between the waves scattered from different shells. The conditions under which the 2mm symmetry breaks down will be presented and discussed.

We will also report a new method to determine the crystallographic indices  $[u, v]$  of carbon nanotubes using electron diffraction. This method is rapid and precise. Only one electron diffraction pattern is needed. With the crystallographic indices determined, the diameter and helicity of the carbon nanotube are readily defined. The electronic properties of the carbon nanotube, such as being metallic or semiconducting, can be told immediately from the symmetry of the electron diffraction intensity distribution.