or more layers that appear to have been folded to form looped edges, as seen in Fig. 33. The edge structure is closely related to that of a *ribbon* formed of a collapsed *nanotube* with a wide *diameter*. [More...]

References:

Alejandro Lopez-Bezanilla, Jessica Campos-Delgado, Bobby G. Sumpter, Daniel L. Baptista, Takuya Hayashi, Yoong A. Kim, Hiroyuki Muramatsu, Morinobu Endo, Carlos A. Achete, Mauricio Terrones, and Vincent Meunier, *Geometric and electronic structure of closed graphene edges*, J. Phys. Chem. Lett. **3**, 2097 (2012).

Fowler-Nordheim relationship describes the electron emission from a surface normal to which a strong local electric field E has been applied. The tunneling electron current density is given by $J = \alpha E^2 \exp\left(-\frac{b\Phi^{3/2}}{\beta E}\right)$, where Φ is the *work function*, α and b are constants, and β is the field amplification factor. For a sparse array of vertically aligned *nanotubes* of *radius* r and height h, the large value of $\beta = h/r$ contributes significantly to high observed current densities $J \lesssim 10^9$ A/cm^2, which correspond to currents of $\lesssim 1$ μA per nanotube. [More...]

Fractional quantum Hall effect → *quantum Hall effect*

Fullerene is a molecule with a hollow *cage* structure consisting of *graphitic* carbon. The name reflects structural relationship to geodesic *domes* constructed by the architect Richard Buckminster Fuller. The most noted fullerene is the C_{60} molecule, called also *buckminsterfullerene* or simply *buckyball*. The smallest fullerene is the C_{20}. Among the possible *fullerene synthesis* routes, *arc evaporation* is most common. Selected fullerenes with less than 100 carbon atoms are shown in Fig. 34. Larger fullerenes, such as the one shown in Fig. 35, have not been observed as single-wall structures, but may form walls in multi-wall fullerenes, called *onions*. The time line of fullerene discoveries is listed in Table 1. [More...]

References:

P. W. Fowler and D. E. Manolopoulos, *An atlas of fullerenes* (Dover, 2006).

Fullerene isomer is a well-defined structure of a *fullerene*. The number of *isomers*, corresponding to the number of ways to distribute 12 pentagons and $n/2 - 10$ hexagons on a C_n surface,

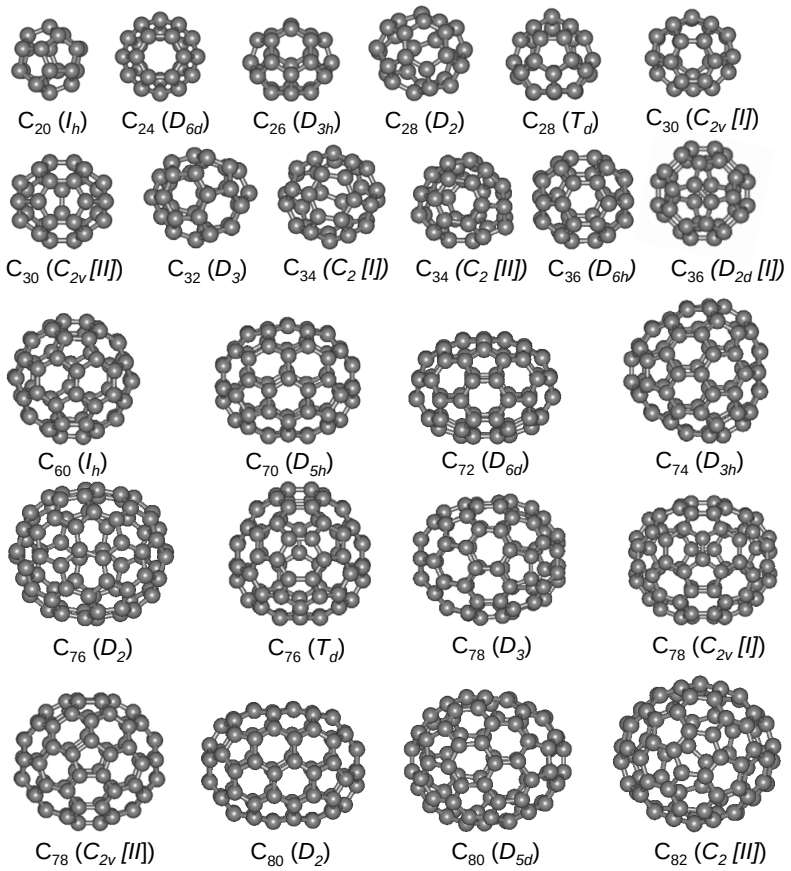

Figure 34: Structural models of selected C_n *fullerenes* with $n < 100$ atoms. Most stable *isomers* with $n \geq 60$ atoms comply with the *isolated pentagon rule* (IPR).

increases rapidly with the size n. [More...]

Fullerene separation from soot containing a mixture of *fullerene* and *metallo-fullerene* molecules with different sizes can be achieved efficiently by High-Pressure Liquid Chromatography (HPLC) with suitable columns, such as the 'buckyclutcher' or 'buckyprep' columns. [More...]