Understanding the lack of fullerenes in fullerene-like carbons

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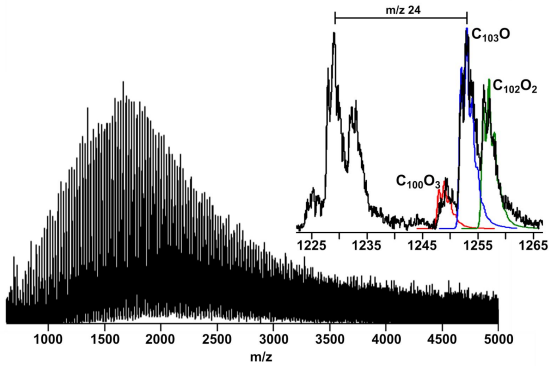
Significant evidence has been demonstrated for fullerene-like curved networks in non-graphitising carbons such as polygonalised structures [1] and non-hexagonal rings [2]. However, many mass spectrometry studies of these materials have found a lack of fullerenes, such as C_{60} and C_{70} [3]. We made use of laser desorption ionisation time-of-flight, Fourier transform ion cyclotron resonance and electrospray ionisation time-of-flight-mass spectrometers to confirm the lack of magic number fullerenes in a gasification charcoal. The m/z 701 ion, near the m/z of C_{60}, was found to be a breakdown product of pyrolysis and not a persistent part of the nanostructure. High resolution transmission electron microscopy and Raman spectroscopy suggested fullerene-like nanostructures were indeed present. Considering heat treated fullerene arc soot we found that the small magic number fullerenes are not stable under carbonisation in inert atmosphere but polymerise and intercalate surface adsorbed oxygen [4]. Reactive molecular dynamics was then used to explore the fullerene coalescence and intercalation process as well as understanding fullerene-like nanostructures without fullerenes.



References: [1] PJF Harris et al., Philos. Mag. A, **1997**, 76, 667 [2] PJF Harris et al., J. of Phys. **2010,** 241, 012050. [3] Bourke et al., Indus. & Eng. Chem. Res., **2007**, 46, 5954. [4] JW Martin et al., Carbon, **2017**, 125, 132