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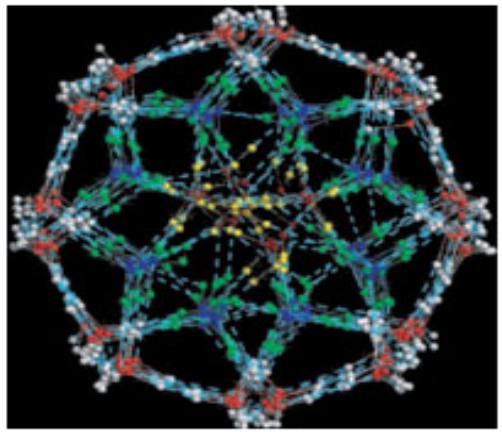
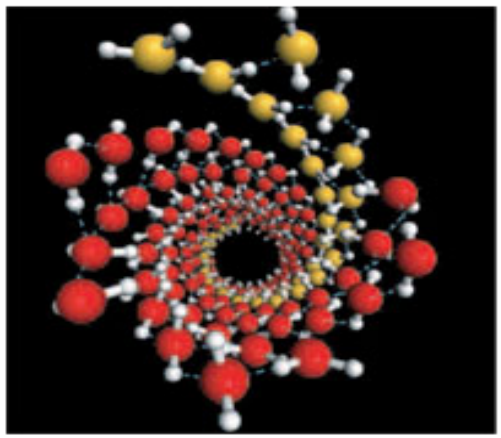
Ice crystals trapped inside nanotubes

18 December 2006

At this time of year there are reminders everywhere of the beautiful structures that water can form when it freezes. But the ice crystals predicted in computer simulations by Xiao Cheng Zeng and colleagues at the University of Nebraska, Lincoln, US, are as striking as any snowflake.[1]



Projected view along the axis of double-walled tubular nanoice formed at 500 MPa



The octuple-stranded nanoice helix consists of four double-helices

The patterns are formed from water freezes under high pressure inside carbon nanotubes. The small width and hydrophobic walls of nanotubes place severe constraints on the hydrogen-bonded network of ice, forcing it to adapt in novel ways. So far, several unusual forms of 'tubular' ice have been identified inside nanotubes at atmospheric pressure. But since ordinary ice undergoes transformations to complex, denser network structures when compressed, Zeng and colleagues suspected that squeezing ice inside a nanotube – as though between pistons placed at each end – might produce interesting new variants.