

## Indian-American devises nano-springs to protect mobile phones

An Indian-American scientist has devised tiny, shock-absorbing carbon nano springs to protect delicate electronic devices like mobile phones from damage.

Apparao Rao, physicist at Clemson University, who led the researchers, working with California University collaborators, showed that layers of these tiny coiled carbon nanotubes, a thousand times smaller than a human hair, can act as resilient shock absorbers.

Similar coiled carbon nanotubes have been fabricated, yet Clemson researchers said this method is unique since beds of coiled carbon nanotubes can be grown in a single step using a proprietary hydrocarbon-catalyst mixture.

The group also envisions coiled nanotubes in soldiers' body armour, car bumpers and bushings and even as cushioning elements in shoe soles.

'The problem we have faced in the past is producing enough of these coiled carbon nanotubes at a reasonable cost to make a difference,' said Rao. 'Because our current method produces coiled nanotubes quickly in high yield, it can be readily scaled up to industrial levels.'

In earlier studies, Rao and his team, along with collaborators, tested more conventional straight carbon nanotubes against coil-shaped nanotubes. When a stainless steel ball was dropped onto a single nanotube layer, the coiled nanotubes completely recovered from the impact, while the straight ones did not.

'It's like an egg toss,' said Rao. 'If you move your hand backward as you catch the egg and increase the time of contact over which the impact occurs, the impact will be less forceful and the egg will not break. It is the same phenomenon experienced in catching a baseball.'

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