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Fabrication of hybrid nanostructures by liquid plasma for biomedical applications¹ SRI BALAJI PONRAJ, XIUJUAN JANE DAI, LUHUA LI, ZHIQIANG CHEN, JAYANTH SURYA NARAYANAN, JAGAT KANWAR, Deakin University, JOHAN DU PLESSIS, RMIT University — Liquid plasma, generated by a nanosecond pulsed generator at atmospheric pressure, was used to treat bamboo-like boron nitride nanotubes (BNNTs). It was observed that the length of the BNNTs was reduced and found more cup like structures called boron nitride nanocups (BNNCs). Interestingly, a new peak appeared at 406.86 eV in the N1s X-ray photoelectron spectrum, which seems to be attributable to the oxidation of nitrogen (N-O) in BNNTs. The C1s spectrum showed that oxygen functional groups were introduced onto the BNNT/BNNC surface. The liquid plasma was also used to assemble gold nanoparticles onto the treated BNNTs/BNNCs. This hybrid nanostructure was fabricated efficiently, compared with normal equilibrium conditions. The pH values and conductivity of all samples were measured. After plasma treatment, the pH values were greatly reduced and conductivity was significantly increased. We propose that the plasma acid, hydrogen peroxide, OH⁻, H ions and radicals formed in liquid plasma as well as the pulsed electric field contribute to the oxidation of nitrogen, reduced length of the BNNTs(forming BNNCs), surface functionalization, and to the fabrication of hybrid nanostructure. The cytotoxic tests for these hybrid nanostructures is underway.

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