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Flexural wave properties of nanotubes conveying fluid[1] PIN LU, Institute of Materials Research and Engineering — Carbon nanotubes (CNTs) with diameters in the range of nanometers have shown various potential applications in nanofluidics. In this work, the flexural wave properties of carbon nanotubes conveying fluid are studied by considering van der Waals (vdW) interactions between the nanotube surface and the fluid. Based on the modified model, the expressions of dispersion relations are derived, and the vdW effect dependent cut-off frequency is obtained. It is found that the wave properties by considering the vdW interactions are significantly different from those obtained based on the conventional models. The propagating flexural waves in the CNTs are shown to occur above the vdW effect dependent cut-off frequency. In addition, in the four branches of the dispersion relations obtained, two of them are found relating to the non-propagating fields, and the other two branches represent propagating flexural waves. These properties may provide a better understanding on the relationships between the flexural waves and the flow velocities of the fluid-conveying components at small length scale level and help to design stable nanotube-based nanofluidic channels.

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