Abstract

Micromachined shallow arches have been under increasing focus in recent years in the Microelectromechanical systems MEMS community because of their unique attractive features. One major advantage is their bi-stability nature, which makes them suitable for switching, sensing, and actuation applications. Particularly, these bi-stable structures do not require power to hold them in either stable state (the on or off positions as switches); they need power only during the transition between the two states. Another advantage in actuation applications is that they can be displaced in large strokes compared to straight and mono-stable structures. Hence, they are also desirable for energy harvesting. Micromachined shallow arches can also be unintentionally produced due to fabrication imperfections, such as stress gradient, residual stresses, and flexible anchors. This phenomenon is also common at the Nano scale. Particularly, fabricating perfectly straight Carbon Nano Tubes CNTs with controlled geometry and orientation is very difficult. Whether it is intentional or not, the curvature of arched structures can have pronounced impact on their static and dynamic behavior, and hence on their practical performance.

In this talk, we will discuss some of the recent research advances relevant to micromachined shallow arched structures. Several case studies will be presented demonstrating the interesting nonlinear behavior of these structures. Both intentionally fabricated in-plane arches and unintentionally fabricated out-of-plane arches (imperfect beams) will be discussed. The potential exploitation of these structures for logic, memory, and sensing applications will be illustrated.