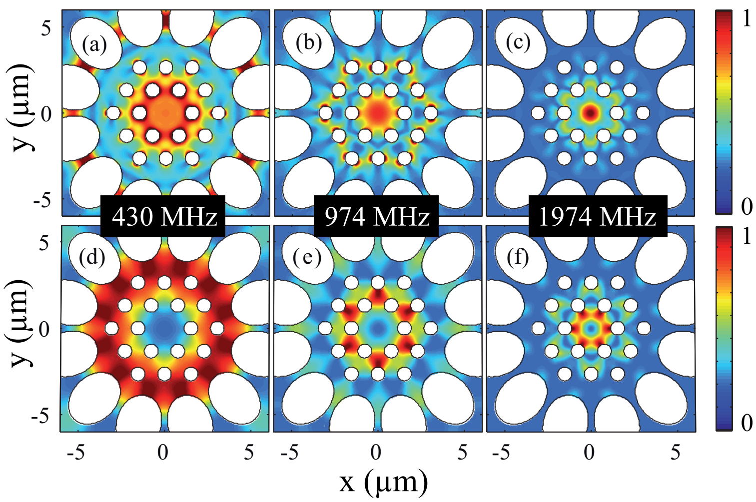

Fig. 5. Numerical simulations (color plot) of a perfect PCF design without any structural irregularity. (a-c) strain energy density distribution and (d-f) elastic energy distribution of the 430, 974 and 1974 MHz acoustic modes confined to the microstructure, respectively.

measured on the SEM image. This suggests that the GAWBS spectrum can be used to provide an accurate measurement of the dimensions of the PCF core. However, this conclusion is not valid for the middle- and the high-frequency modes at 915 MHz and 1940 MHz, because these exhibit $2\pi/6$-symmetry and thus cannot be identified as fundamental rod modes.

4. Conclusion

Guided acoustic wave Brillouin scattering has been investigated in a photonic crystal fiber with a multiscale structure. It has been shown both experimentally and numerically that such air-silica microstructure supports the simultaneous frequency-selective excitation of several transverse guided acoustic modes with frequencies up to 2 GHz. We provided a complete numerical analysis of these acoustic resonances whose frequencies are found to be strongly related to the air-hole microstructure of the fiber. We further demonstrated the impact of structural irregularities of the fiber on guided acoustic modes. Our results suggest that photonic crystal fibers can be advantageously used to enhance and control guided acousto-optic interactions at ultra-high frequency in view of potential applications for fiber-optic sensors or acousto-optic devices.

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