Axial stress profiling for few-mode fiber Bragg grating based on resonant wavelength shifts during etching process

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We proposed an analytical model to describe the relationship between the axial stress profile of a few-mode fiber Bragg grating with the variations in the resonant wavelengths during a chemical etching process. As a mechanism of preserving state of equilibrium, the etched fiber is experiencing a varying axial strain—contractive or expansive depending on the total axial stress over the remaining cross-sectional area of the fiber. It is found that the induced strain on the etched fiber is the main constituent to the blueshifts and redshifts in the resonant wavelengths during the etching process. The proposed model has been experimentally verified and the estimated axial stress profiles are in good agreement with the measurement by the polariscopic technique.