The proposed wavelength de-multiplexers are designed by using wavelength-selective filtering property of photonic crystal structures. These proposed wavelength de-multiplexers are designed and optimized by finite difference time domain (FDTD) method and the band gap of proposed de-multiplexers are calculated by using plane wave expansion (PWE) method.

I have designed 2-D Photonic Crystal of square lattice with identical rods. The refractive index of rods is 3.47 (Si rods) and the radius of rods are taken as 0.18a (where ‘a’ is lattice constant). Optical filters are the basis of proposed wavelength de-multiplexers. Some point defects are created in the photonic crystal structure to generate these optical filters.

It can be seen that photonic crystal with the radius of Si rods r = 0.18a has photonic band gap at the frequency range of 0.2983 ~ 0.4409(a/λ). The value of lattice constant ‘a’ is chosen appropriately to get the required normalized frequency range. If ‘a’ is taken as 0.52μm, the normalized frequency corresponding to two wavelengths 1.31μm and 1.55μm are given by 0.3969(a/λ) and 0.3355(a/λ), respectively. These normalized frequencies lie within the photonic band gap and thus cannot propagate through the photonic crystal until the defect is created.

I can see that for filter with radius of defect rods r = 0.25a, wavelength 1.55μm is in the band gap and wavelength 1.31μm is out of band gap. So wavelength 1.31μm can propagate through the filter while 1.55μm wavelength is restricted to propagate. Filter constructed with radius of defect rods r = 0.36a, passes 1.55μm wavelength and restricts 1.31μm wavelength. Wavelength 1.31μm is obtained at output port 1 and wavelength 1.55μm is obtained at output port 2.

I already designed with rods structure and I want to do same structure in air holes.