

## High quality factor Ta<sub>2</sub>O<sub>5</sub> based micro-ring resonator

Chung-Lun Wu, Ting-Wei Liao, Yi-Jen Chiu, Yuan-Yao Lin,

Ann-Kuo Chu and Chao-Kuei Lee\*

*Department of Photonics, National Sun Yat-sen University, Kaohsiung 804, Taiwan R. O. C.*

**E-mail: chuckcklee@yahoo.com**

Low absorption and crack-free Ta<sub>2</sub>O<sub>5</sub> thin film has been demonstrated by using the reactive sputtering and post-annealing process. The optimized annealing receipt is set as 650°C for 3 hours in the oxygen environment to compensate the oxygen deficiencies of the as-grown Ta<sub>2</sub>O<sub>5</sub> film. By using the E-beam lithography and RIE etching process, the Ta<sub>2</sub>O<sub>5</sub> based micro-ring resonator with diameter of 300 μm is demonstrated. The geometrical dimension of the Ta<sub>2</sub>O<sub>5</sub> waveguide is set as 700×400 nm<sup>2</sup>. The gap between the bus waveguide and ring cavity is designed as 1100 nm. By fitting the transmission spectrum of Ta<sub>2</sub>O<sub>5</sub> based micro-ring resonator, the coupling efficiency and loss coefficient are 1.2 % and 1.5 cm<sup>-1</sup>, respectively. The Q factor and unload Q of 44220 and 51585 in the Ta<sub>2</sub>O<sub>5</sub> micro-ring resonator is demonstrated.