

# DISPERSION AND NONLINEAR ENGINEERING TANTALUM PENTOXIDE THIN FILM FOR SUPERCONTINUUM GENERATION

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Supercontinuum generation (SCG) has been shown its capability for various applications. Recently, stacking structure was proposed and the result show the capability for broadband SCG. In this work, using Ta<sub>2</sub>O<sub>5</sub> as nonlinear material, the stacking structure aimed at achieving anomalous dispersion in the dispersion curve was proposed. The TE fundamental mode was compared by designing three different SiO<sub>2</sub> thicknesses to evaluate their dispersion curve performance. It was found that 10 nm SiO<sub>2</sub> provided better dispersion effects, but considering the difficulty of producing such a thin film, a thickness of 20 nm was chosen as optimal, see Fig. 1. Next, the dispersion simulation of stacking structure clearly indicated that air cladding more easily achieved anomalous dispersion compared to an oxide cladding. Nonlinear Schrödinger simulations for the waveguide with a width of 1200 nm, thickness of 620 nm and air cladding showed that soliton fission occurred around a waveguide length of 6 mm, promoting spectral broadening, see Fig. 2. The device with stacking structure was prepared by using standard process. The application for SCG is still on-going and expected to present in the conference.

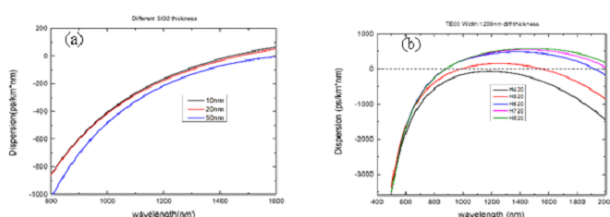


Fig.1 (a) This figure shows the dispersion performance of different SiO<sub>2</sub> interlayers. The results indicate that 10 nm performs the best. (b) This figure shows the dispersion performance for different waveguide thicknesses. The thicker the waveguide, the larger the dispersion peak value.

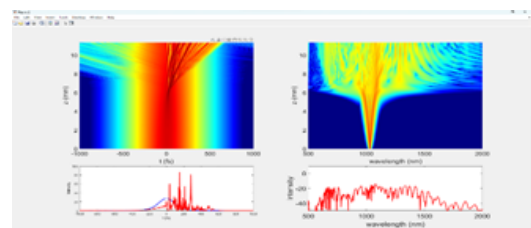


Fig.2 This figure shows the simulation results of the nonlinear Schrödinger equation, indicating that the spectrum can be fully broadened at a length of 10mm

## References

1. M. R. Karim, "Broadband Supercontinuum Generation using Ge<sub>11.5</sub>As<sub>24</sub>Se<sub>64</sub> Strip/Slot Hybrid Waveguide with Four Zero Group Delay Dispersion Wavelengths," (2021).