

Under the intermodal phase-matching condition, a 100- μm -long nonlinear fiber with 40 bilayers of PB/PAH coating can achieve 10% SHG efficiency with a pump peak power of 400 W. Work in this direction is currently in progress. Finally, we point out that the cutoff radii for TM_{01} and HE_{21} mode are 0.235 and μm 0.269 μm (at pump wavelength of 1294 nm), respectively. Therefore, for any given pump wavelength, there is a lower limit on taper size, below which we should not observe any significant second harmonic generation.

4. Conclusion

We have experimentally demonstrated that a cylindrically symmetric nonlinear fiber can exhibit significant second order nonlinearity. The nonlinear fiber is fabricated utilizing a hybrid covalent/ionic self-assembly technique and is thermodynamically stable. Despite the overall rotational symmetry of the nonlinear fiber, we have observed significant second harmonic generation. We can attribute the SHG to the radially aligned nonlinear molecules, and have obtained good agreement between theoretical predictions and experimental measurements. Further improvement in nonlinear conversion efficiency can be obtained by achieving phase matching using different methods in current literature.

Acknowledgements

We thank Dr. Howard Schlossberg for generous support from the Air Force Office of Scientific Research (FA9550-07-1-0357). This work uses the facilities at the Institute for Critical Technology and Applied Science (ICTAS) Nanoscale Characterization and Fabrication Laboratory (NCFL) at Virginia Tech for sample characterization and analyses.