**J. Chan, J. Chan, Albert W. Lu, Albert W. Lu, Alan Man Ching Ng, Alan Man Ching Ng, A. B. Djurišić, A. B. Djurišić, Aleksander D. Rakić, Aleksander D. Rakić, } "Organic quantum well light-emitting diodes", Proc. SPIE 6038, Photonics: Design, Technology, and Packaging II, 60381M (18 January 2006); doi: 10.1117/12.638370;** [**https://doi.org/10.1117/12.638370**](https://doi.org/10.1117/12.638370)

This paper simulates a multi-layer quantum well LED architecture utilizing NPB as the Hole Transport Layer (HTL), ALQ3 as the potential barrier and Electron Transport Layer, and Rubrene as the potential well layer. They simulated and validated through experimentation a single layer and double layer quantum well architecture showing improved luminosity and power consumption. The quantum well architecture provides one method of confining the recombination region potentially separating it from the transport mechanics.

**List E. J. W. *Interaction of singlet excitons with polarons in wide band-gap organic semiconductors: A quantitative study*. Physical Review, 9/26/2000. Print.**

This paper provides a comprehensive study of unimolecular and bimolecular interactions and decay rates. It notes that unimolecular interactions typically happen at lower densities of singlet excitons while bimolecular interactions happen at higher densities. Furthermore, through experimentation it shows that using PL(A)DMR, magnetic resonance can help to encourage a transition in population densities from triplet to singlet state excitons due to magnetic spin coupling and selection rules. Finally, it confirms that at increasing singlet exciton densities, polaron-exciton quenching becomes the limiting problem which used to be attributed to singlet-singlet annihilation.

**Dyakonov, Mikhail. *Spin Physics in Semiconductors*. Spriner-Verlag Berlin Heidelberg, 2008. Print.**

This book provided foundational information on spin dynamics in inorganic semiconductors such as spin-orbit coupling, and nuclear spin coupling. Due to spin-orbit coupling, holes in the valence band separate into light and heavy holes which have spins of ½ and 3/2, respectively. This book provided insight into the available spin states potentially within pi-conjugated organic semiconductors. Further work should be done in developing spin selection rules for conducting electrons and holes in polymers.

**Tessler, Nir. *Lasers Based on Semiconducting Organic Material*. Advanced Materials, 2000. Print**

The overarching article that addresses the main known complication with electrical pumped organic lasing devices. To have lasing, the device needs to have optical gain. However, in organic semiconductor materials, the appearance of polarons in the emissive layer will absorb the emission of singlet exciton state. Furthermore, electrical excitation unlike photoexcitation produces triplet states reducing the population of singlet exciton states which actually fluoresce. Finally, due to coupling of positive ions at the metal electrode with photon excitation, there is high energy loss due to absorption.

**Strobl, G. R. *The Physics of Polymers: Concepts for Understanding Their Structures and Behavior*. Springer-Verlag, 2007. Print.**

This book proves extensive background on polymers (only read chapt. 7 on conjugated polymers as they were the most relevant to the task at hand). This section provides foundational knowledge of conductive polymers such as their charge transport (polarons), excited states, conductivity, etc.

**Nunes-Neto Oswaldo. *Magnetic field effects in Alq3-based OLEDs investigated by electrical impedance spectroscopy*. ELSEVIER 8/3/2017. Print.**

This paper demonstrated the effect of an external magnetic field on electrical impedance in Alq3-based OLED devices. They showed that the effects of the magnetic field do not have a temperature dependence and that the MFEs lead to increased carrier mobilites, but decreased Langevin recombination.

**Fairclough, Caty.  *Simulation Paves the Way for More Efficient OLED Devices*. COMSOL 4/7/2016. Web.**

This blog provides two key pieces of information: OLED research with COMSOL and increasing OLED efficiencies. This blog demonstrates a decrease plasmon loss at the metal electrode using a nano-gradting which reduces coupling between the plasmons and emitted photons accounting for 40% loss in traditional OLED devices.

**Alias A. N. *Optical Characterization and Properties of Polymeric Materials for Optoelectronic and Photonic Application*. International Journal of Applied Scient and Technology: 5/2013**

Provides extensive empirical characterization values (absorption, direct bandgap, indirect bandgap, Urbach edge) of optoelectronic polymers.

**Monkman, A. P. and Burrows, H. D. and Hartwell, L. J. and Horsburgh, L. E. and Hamblett, I. and Navaratnam, S. (2001) *Triplet energies of pi-conjugated polymers*, Physical review letters., 86 (7). pp. 1358-1361**

Provides extensive empirical energies of optoelectronic polymers for both singlet and triplet exciton states.

**This Masters Thesis project investigates the effect of an external magnetic field on carrier mobility and population density as well as excitation population density in an organic quantum well laser diode.**