**Department of Materials Science and Engineering,**

**Candidacy Exam**

**Date & Time**

**Thursday, June 18, 2020 10AM- 12PM**

**Where**

**Zoom (https://drexel.zoom.us/j/98176504642)**

**Title**

# PET-RAFT Polymerization: Greener Chemistry, Advanced System Parameters, and Mechanistic Features

**Name:**

**Olivia Wilson**

**Advisor:**

**Dr. Andrew Magenau**

## Abstract

Implementation of photochemical initiation to polymer science has prompted the development of green and efficient polymerization systems to generate precise polymer architectures. In contrast to thermally initiated polymerizations, photoinitiation is rapid at ambient conditions due to a large energy disparity between the two systems. Moreover, photoinitiation permits temporal and spatial control by virtue of the extrinsic nature of light mediated polymerizations. With the development of LED technology, production of light possesses more precision over emission wavelength without the need for complex equipment. By utilizing the powerful reductive properties of photocatalysts and the controlled polymerization properties of RAFT, the development of photoinduced electron/energy transfer (PET)-RAFT was established as a new method for efficient polymerization of well-defined polymers *via* light mediation. Numerous photocatalysts have been exploited for PET-RAFT under visible light irradiations that span the entire visible light spectrum, and two catalyst systems including an iridium metal complex ($Ir(ppy)_3$) and zinc tetraphenylporphyrin (ZnTPP) will be highlighted in this discussion. PET-RAFT naturally affords more polymerization control compared to conventional systems due to the ability to regulate reaction rates using parameters such as, chemical environment, catalyst loading and light intensity, and irradiation wavelength. The system parameters that dictate the polymerization properties permit several features of PET-RAFT that will be discussed. Specifically, the features of PET-RAFT such as, spatiotemporal control, photocatalyst recyclability, selective photoactivation, and process adaptability are attractive for advancement of green and efficient polymerization. The features of PET-RAFT and an application of PET-RAFT for flow polymerization will be discussed in more detail. Finally, challenges and future considerations of PET-RAFT for precision polymerization will be discussed.