

**UNIVERSITY OF RHODE ISLAND**  
**Department of Chemistry**  
**SEMINAR**

**Room 105 Beupre Center**  
**3:00 p.m., Monday, November 15, 2021**

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**URI**

***“Catalysis of the Thermal Decomposition of  
Transition Metal Nitrate Hydrates by  
Poly(vinylidene difluoride)”***

**HOST**

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# Catalysis of the Thermal Decomposition of Transition Metal Nitrate Hydrates by Poly(vinylidene difluoride)

Poly(vinylidene difluoride) (PVDF) is a semicrystalline polymer that is of interest in many applications due to the potential electroactivity of the polymer. The preparation of PVDF composites by doping with transition metal nitrate hydrates increases the polar  $\beta$ -phase, which induces an inherent ferroelectricity in the polymer matrix. A combination of the electroactivity of PVDF and metal oxides is expected to be beneficial as a piezoelectric energy generator, as an efficient catalytic system, and in environmental remediation which addresses the global energy conservation challenge. I will discuss how to fabricate high  $\beta$ -phase metal ion/PVDF thin films, synthesis of metal oxides in the polymer matrix using thermal decomposition and finally a mechanism, which explains how PVDF is involved in the oxide synthesis process. The thermal study of the prepared composite thin films shows the decomposition of transition metal nitrate hydrates happens at a lower temperature when doped in PVDF than its pure salt state. The temperature shift for 2+ charged metal ions is in the range of 175-25 °C, which clearly evidences the PVDF acts as a catalyst in chemical reactions for the 1<sup>st</sup> time. The local electric environment in high polar PVDF facilitates molecular rearrangement, bond alignment and cleavage, and ultimately converts reactants to products at a lower temperature. Gas-phase FTIR data show the emission of NO<sub>2</sub>, and H<sub>2</sub>O are the main volatile decomposition products while the solid phase FTIR and XRD data reveal the successful formation of desired metal oxides in PVDF composite at the end.