

Title: **Polymerization with phosphonium-organocatalysts: A kinetic study**

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The kinetic study results of acrylonitrile (AcN) polymerization with phosphonium-organocatalysts are presented herein. The influence of temperature, steric hindrance, base ratio, activation time and phosphonium dilution has been qualitatively determined. A detailed quantitative study of the temperature dependence has been carried out, showing this polymerization to be a 0 order reaction, with a rate constant value of $k=4.1717 \text{ mol}\cdot\text{dm}^{-3}\cdot\text{min}^{-1}$ at $-30 \text{ }^\circ\text{C}$ (as the highest constant rate), obeying the Arrhenius equation and with an activation energy value of $E_a= -9.028 \text{ kJ}\cdot\text{mol}^{-1}$. Best conditions for the fastest polymerization of AcN are found out to be: $-30 \text{ }^\circ\text{C}$, Trimethylphosphonium tetrafluoroborate as phosphonium salt, potassium carbonate as base, 100 base to phosphonium ratio, 10 min activation time and a low phosphonium dilution factor. Number average molecular weights (M_n) and polydispersity index (PDI) values have been obtained by GPC measurements and kinetics have been followed with $^1\text{H-NMR}$ measurements: in order to plot the yield as a concentration dependent measurement.

Keywords: Anionic polymerization, acrylonitrile, phosphonium, catalysis, kinetic.