Vinyl polymers degradable through main chain scission by retro-aldol reaction over the backbone and pendants

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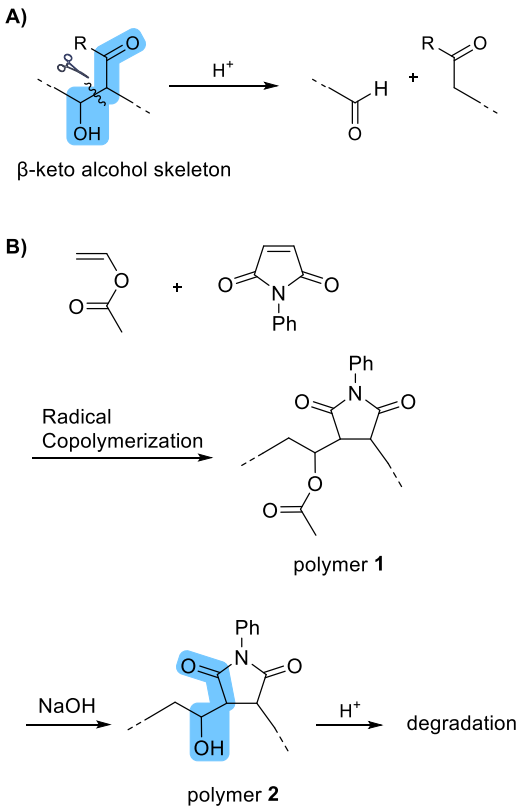
Retro-aldol reaction (**Scheme A**), proceeding in a β-keto alcohol skeletons (highlighted by light blue), is known as a common tool for the cleavage of carbon–carbon bond in organic synthetic chemistry. We have envisioned that the reaction is also effective for the degradation of vinyl polymers through main chain scission.

In order to incorporate β-keto alcohol skeletons covering over polymer backbone and pendants, the radical copolymerization of an equimolar mixture of vinyl acetate (VAc) and *N*-phenyl maleimide (PMI), a pair of electron-rich and electron poor monomer for the alternative sequence, was conducted (**Scheme B**). The polymer **1** had a number-averaged molar mass (M_n) and dispersity of molar mass ($Đ$) of 5200 and 1.76, respectively, and the composition was [VAc]/[PMI]=30/70. Thus, **1** was not an ideal alternating copolymer. The hydrolysis of **1** with NaOH was conducted; the degree of saponification of VAc units was 87%, while the M_n was decreased to 1900 ($Đ$ = 1.08). The obtained **2** was then treated with 3 equimolar of hydrochloride in a cosolvent of water and dimethyl sulfoxide. The M_ns of the polymer were gradually decreased and reached 620 after 5 days, suggesting a possibility of the main chain scission by retro-aldol reaction. Additional experiments to confirm the reaction mechanism is in progress.



Scheme A) Retro-aldol reaction under acid condition. **B**) Copolymerization of vinyl acetate and *N*-phenyl maleimide.