

## FRONTAL POLYMERIZATION OF DYNAMIC NETWORKS

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Frontal polymerization (FP) enables the conversion of monomers into polymers in a spatially confined reaction zone (front). There, the reaction zone spreads through the bulk material in an autocatalytic self-propagation, which is similar to an avalanche (Figure 1). The front is driven by exothermic heat generation, with the only necessary external energy input occurring during the initiation process. Frontal polymerization has been investigated for several monomers due to its rapid curing and its high energy efficiency. Of high relevance are epoxy resins, which are industrially abundant, as well as acrylate monomers. These are usually cured by photopolymerization or thermal processes.

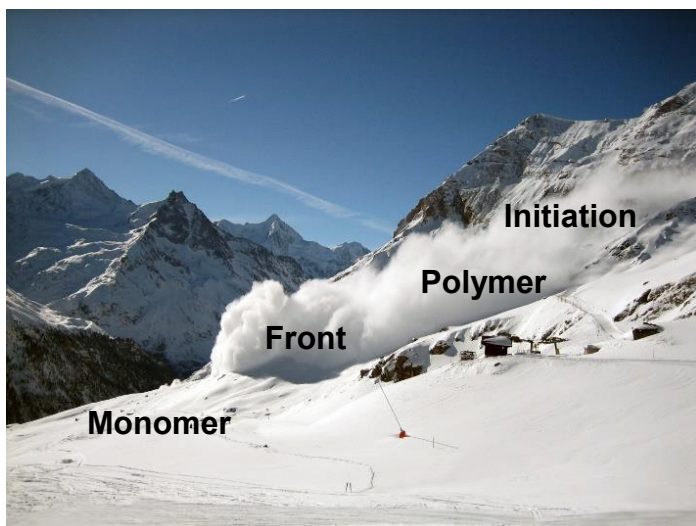


Figure 1\_Frontal polymerization avalanche

However, both conventional thermal curing and photopolymerization suffer from serious disadvantages. In thermal polymerization processes, extensive curing times and high energy input are still issues, whereas photopolymerization is more rapid. Due to the low penetration depth of the light, only thin layers can be cured, though. To overcome these drawbacks, various kinds of frontal polymerization were employed. Similar to conventional thermally and photo-cured networks, the polymer networks formed are characterized by high chemical and thermomechanical resistance. Nowadays, other factors besides energy efficiency play an important role, such as recyclability, reusability and reprocessability. These can be implemented by the introduction of dynamic bonds into thermoset materials. Commonly, transesterification reactions between free hydroxy- and ester moieties are implemented by using suitable catalysts. In this work, various different types of dynamic bond exchange reactions have been investigated for their applicability in frontal polymerization.