SELVOL™
POLYVINYL ALCOHOL

Selvol Polyvinyl Alcohol; A High Green Strength, Clean Burnout Binder for Ceramics

Selvol Polyvinyl Alcohol (PVOH) is used in a number of different ceramic processes to impart strength and improve machinability of the green ceramic body. The high green strength provided by PVOH, combined with the very controlled and clean burn-out of this material in a variety of atmospheres, makes it an excellent binder for many ceramic manufacturing processes.

The controlled manner in which Selvol PVOH thermally degrades offers many advantages over other polymer systems which may degrade too rapidly, causing cracking or breakage of the ceramic part during firing. This controlled degradation process is a function of the unique chemical nature of PVOH and is sensitive to the amount of oxygen present. In normal air, the initial weight loss associated with the degradation process is much slower than the weight loss observed in a nitrogen or oxygen deficient atmosphere as seen by the Thermal Gravimetric Analysis (TGA) (Figure 1 on reverse side). In both atmospheres the first step in the degradation process is very similar. This involves the loss of water and acetic acid from partially hydrolyzed grades of PVOH to yield a "polyene" structure. The release of acetic acid is minimized with fully hydrolyzed grades of PVOH because of the lack of acetate groups present in the molecule.

In air or oxygen rich atmospheres, the polyene structure is oxidized, causing a decrease in the rate of weight loss.

This oxidized structure then degrades further to carbon dioxide (Figure 2 on reverse side). In an oxygen deficient atmosphere, the polyene structure depolymerizes to form small molecule aldehyde species such as crotonaldehyde (Figure 3 on reverse side). However, the depolymerization process is not as efficient as oxidation at removing the polymer, so the material needs to be heated longer or at higher temperatures to ensure the complete removal of the binder system.

Another advantage of Selvol PVOH is that no sulfur containing compounds are used in its production. This differs from some other polymeric binders which may use sulfur-based initiator systems. The lack of sulfur in Selvol PVOH means that there are no hazardous organo-sulfur compounds emitted as by-products during the burn-out process.

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FIGURE 1: Thermal Gravimetric Analysis of PVOH in Air and Nitrogen Atmospheres

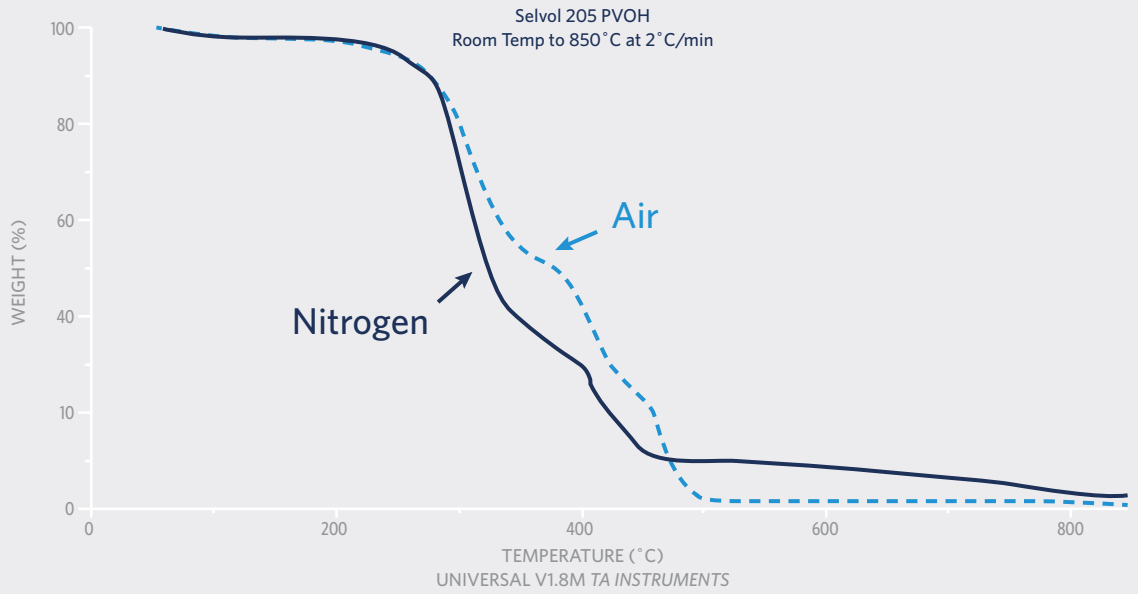


FIGURE 2: Simplified Thermal Degradation Mechanism of PVOH in Oxygen Rich Atmospheres

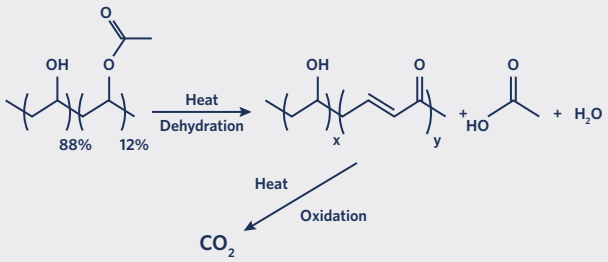
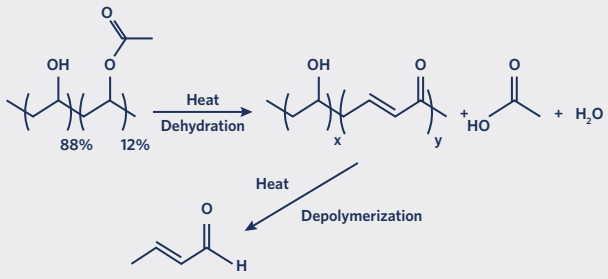


FIGURE 3: Simplified Thermal Degradation Mechanism of PVOH in Oxygen Deficient Atmospheres



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