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From: .J. Lyons-Hart

Subject: .EGA of ART Feed Filler Treated with Ammonium Bicarbonate C89-00571

Two samples of ART feed filler before extraction were submitted for evolved gas analysis(EGA). Water content of a control sample was adjusted to a target OV of ~26% by overspray. Another sample was sprayed with a solution of water and ammonium bicarbonate to a content of ~3% AB by weight and a target OV of ~26%. Three 10 gram samples of each were analyzed by the standard oven volatiles method(OV). The average OV was determined to be 22.2% for the ART feed control and 23.3% for the AB treated sample.

Each sample was analyzed using a 0.5 gram aliquot by the standard EGA technique using nitrogen gas as the carrier. Water is expected to be the major component lost in the OV oven. Figure 1 shows the water profiles of both samples. The evolved water profile for the AB treated feed filler is slightly broader and more intense in the temperature range of ~25°C to 120°C, also the AB treated feed filler shows a larger loss of water from ~120°C to 160°C. These data are consistent with the OV results.

Ammonium bicarbonate has been reported to begin decomposition at 60°C, and to be decomposed by hot water. The break down products are as follows: ammonia=21.5%, carbon dioxide=55.7%, water=22.8%.[1] The 100°C temperature of an OV oven is certainly high enough to decompose the ammonium bicarbonate. AB has a endothermic heat of solution. Possibly, a heat loss could be detected before a major transition or reaction takes place. Rate profiles for the EGA technique are compiled from temperature readings taken from the thermocouple inside the sample. Once the EGA oven is started it attempts to heat the sample at a rate of 5°C per minute. When reactions are of such a magnitude to shift heat load, they can be recorded as rate fluctuations. In Figure 2, the rate profiles for both samples are shown. The AB treated feed filler exhibits two endotherms, (#1) occurring ~ 104°C and (#2) ~ 119°C. Figure 3 is the scale expanded comparison of the carbon dioxide, ammonia, and water profiles for the AB treated feed filler. The #1 endotherm appears to coincide with changes in the evolution of ammonia and carbon dioxide. When the temperature of the sample has reached 104°C, the carbon dioxide concentration is on the rise while the ammonia is declining. As these gases appear to track downward just before the observed endotherm, some type of reaction seems to be initiated. The melting point of ammonium bicarbonate is 107.5°C.[2] This endotherm may indicate this transition, but it is difficult to ascribe one reaction to an event because of the complexity of chemistry during thermal degradation. The profiles shown in Figure 3 have the following maximum evolution temperatures: water= ~ 84°C, carbon dioxide= ~ 89°C, ammonia= ~ 93°C. The maximum evolution temperature for water from the ART feed filler is ~ 83°C, which indicates the AB treatment did not affect the maximum temperature of water evolution from