

## Study on Thermal Decomposition Characteristics of AIBN

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### **Abstract**

AIBN (2,2'-Azobis (isobutyronitrile)) is a self reactive material widely used for blowing agent and initiator. A number of researches were done to characterize its thermal decomposition and it is basically considered as a TD (thermal decomposition) type of decomposition. However there is still ambiguity. When we used a cylinder Dewar vessel, it behaved as quasi-AC (auto-catalytic) decomposition at 50 °C (Fig.1); whereas when in a sphere Dewar vessel with better adiabaticity, it underwent TD decomposition at 45 °C (Fig.2). In order to clarify its thermal decomposition characteristics, various thermal analysis was conducted by DSC, HPDSC, TG-DTA, scanning at 20, 10, 2.5, 2.0, 0.5 K/min. It implies that in sealed DSC and HPDSC, a small endothermic peak appears just before its thermal decomposition; This peak does not appear at lower scanning rate or in open TG-DTA. This may be owing to the sublimation of AIBN or change of crystal. In other references, some said that classification of self-heating chemicals may be based on the TG-DTA (open) data, but we think it unreasonable because in open system the evaporation or sublimation may affect the results. By contrast, in sealed system and using DSC classification may become more scientific. According to these data, the phenomena of AIBN in the Dewars can be explained. Its critical decomposition temperature in the cylinder Dewar is at 50 °C, right lying on the point of physical sublimation, leading to quasi-AC (auto-catalytic) decomposition at 50 °C with temperature distribution throughout the sample (two-phase decomposition). On the other hand, the decomposition temperature was shifted to 45 °C in Fig.2 thanks to a lower heat transfer coefficient of sphere Dewar (1/8 of that of the cylinder Dewar) and jumped ahead of its sublimation point, so solid phase decomposition took place. By this means, the SADT (self accelerating decomposition temperature) of AIBN or other azo compounds may be determined more scientifically.

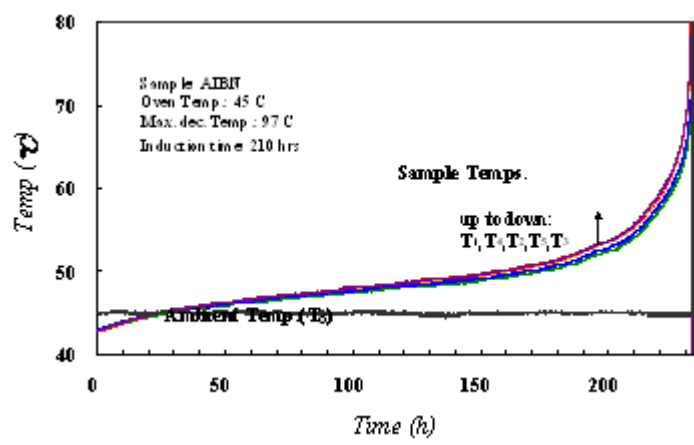
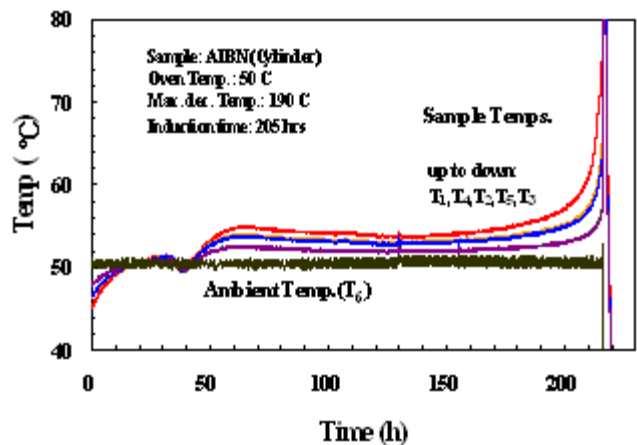


Fig.1. AIBN in a 500 ml cylinder Dewar

Fig.2 AIBN in an 1000 ml sphere Dewar