

# Forensic identification of mechanical pencil leads by TG/DTA with sample observation

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Ignition studies of wood and rubber materials have been performed in the past using a TG/DTA system that allows visual sample observation <sup>[1], [2]</sup>. The ignition is caused by oxidation decomposition of the carbon, but measuring a variety of carbon samples has shown that some samples did not experience ignition <sup>[3]</sup>.

In this report, analysis of mechanical pencil lead is presented. Initially chosen for study due to its high carbon content, visual observation during TG/DTA analysis yielded interesting results. While lead did not show an ignition flash, the images allowed characterization of the oxidative decomposition based on various types of carbon and other ingredients. Furthermore, while elemental techniques such as XRF can be used in identifying pencil lead on paper, the limited sample quantity can be problematic. The optical images collected during TG/DTA analysis revealed characteristic behaviours of the pencil marks. As a result, the technique can be useful in identifying types of lead.

[1] Y. Nishiyama, K. Shibata, K. Yamada, “The design for high temperature measurement of TG/DTA that enabled optical observation”, 50th Japanese Conference on Calorimetry and Thermal Analysis, Sep. 30th 2014, Osaka (Japan)

[2] B. Goolsby, Y. Nishiyama, M. Iwasa, K. Shibata, “Development of a TG/DTA system with high resolution optical observation capability and its Advantages”, NATAS 2015, Aug. 12th 2015, Montreal (Canada)

[3] H. Takahashi, E. Shimoda, Y. Nishiyama, “The evaluation of oxidation decomposition using optical observation TG/DTA”, 51st Japanese Conference on Calorimetry and Thermal Analysis, Oct. 8th 2015, Saitama (Japan)

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