1993 **Title:** **Thermal Analysis of Recovery Boiler Deposits**

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ABSTRACT:

Deposition of inorganic salts on the tube banks located in the upper section of kraft recovery boilers results in plugging of the gas passages and fouling of the heat-transfer surfaces. Frequent soot blowing is required to remove deposits and keep tubes clean. The nature of the deposits and the ease by which they can be removed by soot blowing is strongly dependent on their chemical composition and the local flue-gas temperatures. The effect of chloride and potassium on depressing the melting points of deposits has been the focus of studies by Reeve et al. A good review of this topic can be found in the book by Adams and Frederick.

Performance testing of recovery boilers includes routine collection of fly ash or deposit samples for chemical analysis. The chemical composition can be used to predict melting temperatures. However, a method to actually measure the thermal behavior of deposits has the potential to provide additional information. A relatively simple technique for quantifying the thermal behavior of materials, that can readily be performed by commercial laboratories, is differential thermal analysis (DTA).

In DTA, small amounts of the sample and an inert reference material are heated at a constant rate. The temperatures of the sample and reference are continuously recorded, and the difference in temperature is plotted as a function of time (or temperature). Events such as melting, dehydration, rearrangement of molecular structure, or chemical reactions are exothermic or endothermic and will be recorded as peaks or valleys on the thermograph. These thermographs can be used to determine the melting points.

Skrifvars et al. refer to the use of DTA for determining the first melting temperatures of synthetic salt mixtures. Their work was directed at quantifying sintering at relatively low temperatures. Their laboratory mixtures of sodium-potassium-carbonate-sulfate-chloride were reported not to exhibit any exothermic or endothermic behavior below 515°C.