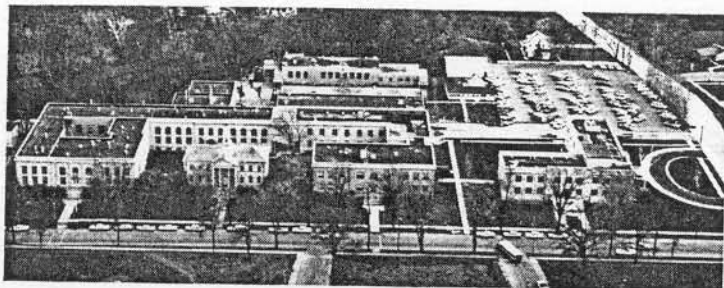


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**REACTION OF  $\text{Na}_2\text{CO}_3$  FUME PARTICLES WITH  $\text{SO}_2$  AND  $\text{O}_2$**

**GREG P. MAULE AND JOHN H. CAMERON**

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# REACTION OF $\text{Na}_2\text{CO}_3$ FUME PARTICLES WITH $\text{SO}_2$ AND $\text{O}_2$

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## ABSTRACT

This paper describes the reaction of  $\text{Na}_2\text{CO}_3$  fume particles with  $\text{SO}_2$  and  $\text{O}_2$ . This was the first time the reaction has been studied using fume particles similar to those in the kraft recovery boiler. The sodium carbonate fume was generated by purging a  $\text{N}_2$ /air mixture through a  $\text{Na}_2\text{CO}_3$ - $\text{Na}_2\text{S}$  melt. Kinetic data were obtained by following the weight gain of the sample as the reaction progressed. The activation energy for the reaction was 5522 cal/mole. The rate limiting mechanism was diffusion through the product layer. The reaction was first order with respect to  $\text{SO}_2$  and zeroth order with respect to  $\text{O}_2$ . Sulfation of the carbonate particles caused considerable sintering of the particles at relatively low temperatures. The degree of sintering increased as the fraction conversion increased. The data were accurately described by the unreacted shrinking core model for both kinetic and diffusion control.