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**Dynamics of Phase and Chemical Transformations
in the Combustion Wave of the Thermit Composition NiO/Ni/Al**

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ABSTRACT

Complex mixtures formed of thermic and elemental components are often used in solving fundamental and applied problems in the fields of combustion and materials science. Chemical conversion in such mixtures is a multistage process consisting of a number of concurrent and successive stages. Experiments on the phase dynamics in the liquid-phase combustion wave in the NiO/Ni/Al mixture for the first time allowed the time ranges of the stages involved to be evaluated. An experimental study was performed in two steps: (1) development of the preparatory procedures and investigation of the regularities of the sample combustion and (2) investigation of the dynamics of phase transformations in the combustion wave by time-resolved X-ray diffraction and an X-ray microanalysis. At the first step, it was shown that one of the successful approaches to the problem solution was employing pressed samples composed of two layers of Ni/Al and NiO/Ni/Al. Such samples exhibited stable burning and retention of their primary shape and size. Liquid-phase products distributed over the substrate surface as a thin two-phase film and after crystallization and cooling were identified as (Ni–Al/Al₂O₃). The second step investigations revealed a long and complicated dynamics of the phase transformations in the NiO/Ni/Al mixture.