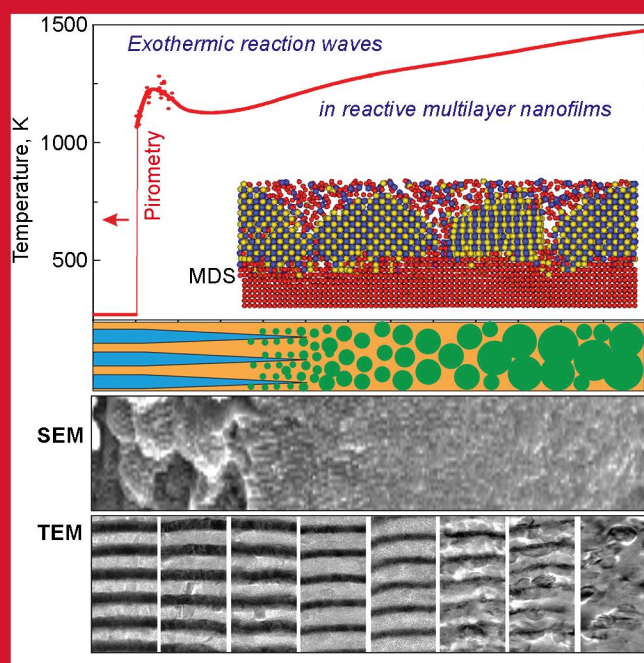
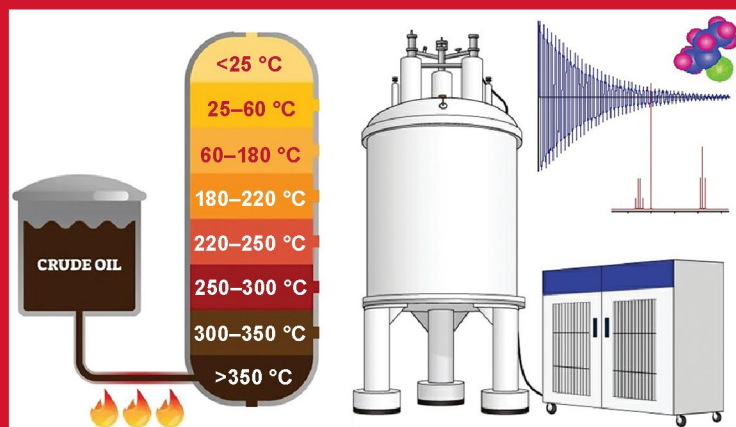


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# Успехи химии

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**Carbon dioxide and ‘methanol’ economy: advances in the catalytic synthesis of methanol from CO<sub>2</sub>** **RCR5101**

A.L. Maximov,<sup>a,b</sup> I.P. Beletskaya<sup>a,b</sup>

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Development of the ‘methanol’ economy may be a way to establish the new chemistry under decarbonization conditions. Methanol here is used as a feedstock for production of a wide range of chemicals conventionally derived from oil. The key process for the ‘methanol’ economy is the reduction of CO<sub>2</sub>, which, along with renewable energy, is the main carbon-containing resource in the low-carbon industry. This review summarizes recent data on the main approaches to methanol production from CO<sub>2</sub>: catalytic hydrogenation of CO<sub>2</sub> with hydrogen on heterogeneous and homogeneous catalysts; electrochemical reduction of CO<sub>2</sub> to methanol; and CO<sub>2</sub> conversion using photocatalysis. The main advantages and disadvantages of each method, the mechanisms of CO<sub>2</sub> conversion taking into account the features of each type of catalysis, and the main approaches to the efficient catalysts are discussed.

Bibliography — 542 references.

**Recent advances in the NMR of fuel: a brief overview** **RCR5105**

L.B. Krivdin

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Present review covers the most recent advances in the NMR studies of oil refining products — light fractions, different types of fuels, heavy fractions, and crude oil itself. By no means does it discuss NMR applications in this field in detail providing only a brief overview of different NMR methods used for the structural elucidation of the oil refining products together with crude oil with particular emphasis on recent achievements and advances in this field.

Bibliography — 48 references.

**Reactive multilayer nanofilms: time of scientific and technological maturity** **RCR5106**

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The review presents the results of recent research and the latest developments in the field of reactive multilayer nanofilms (RMNFs), which were first obtained in the mid-1990s and have now formed a special class of energetic materials produced by layer-by-layer deposition. This class includes M/Al systems (M = Ni, Ti, Zr, Pt, Pd), other bimetallic systems (Ni/Ti, etc.), M/Nm systems (M = Ti, Zr, Nm = Si, B, C) and thermite systems (Al/CuO, etc.) and continues to expand. The emergence of RMNFs stimulated elaboration of new experimental diagnostic methods and computer models for fast physicochemical processes. It is shown that the reaction in the front of a self-propagating exothermic wave occurs in a time of the order of microseconds, which is determined by the rate of dissolution of a solid reactant in the melt of the second, low-melting reactant (usually Al) and by the rate of liquid-phase diffusion. The unique properties of reaction waves in RMNFs are used in novel technologies for bonding dissimilar materials. Bibliography — 160 references.