

MATRIX CONVERSION OF ENRICHED METHANE–OXYGEN MIXTURE AT ELEVATED PRESSURES

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Abstract: High costs of natural gas-to-syngas conversion urge to search and investigate new alternative ways of its production. One of opportunities is the technology of matrix conversion, whose strong side is the possibility of converting hydrocarbon mixtures of varied composition to syngas while reducing the costs for production facilities. Taking in consideration that modern technologies require a syngas free from ballast nitrogen for consecutive Fisher–Tropsch synthesis stage, an interesting solution can be the organization of matrix conversion of enriched methane–oxygen mixtures at elevated pressures, which will allow cost reduction for consecutive gas compression and thus increase of converter productivity.

Keywords: natural gas; syngas; matrix conversion

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References

1. Arutyunov, V. S., V. M. Shmelev, I. N. Lobanov, and G. G. Politenkova. 2010. Generator sintez-gaza i vodoroda na osnove radiatsionnoy gorelki [A generator of synthesis gas and hydrogen based on a radiation burner]. *Teoreticheskie osnovy khimicheskoy tekhnologii* [Theoretical Foundations of Chemical Engineering] 44(1):21–30.
2. Arutyunov, V. S., V. M. Shmelev, A. N. Rakhmetov, and O. V. Shapovalova. 2014. 3D matrix burners: A new method for small-scale syngas production. *Ind. Eng. Chem. Res.* 53:1754–1759.
3. Arutyunov, V. S., V. M. Shmelev, A. N. Rakhmetov, O. V. Shapovalova, and L. N. Strekova. 2013. Okislitel'naya konversiya uglevodorodnykh gazov v regime poverkhnostnogo goreniya [Oxidative conversion of hydrocarbon gases in the surface combustion mode]. *Izvestiya RAN. Ser. Khimicheskaya* [Russ. Chem. Bull.] 7:1504–1509.

4. *Shapovalova O. V., A. N. Rakhmetov, V. M. Shmelev, A. A. Zakharov, and V. S. Arutyunov.* 2014. Okislitel'naya konversiya uglevodorodnykh gazov v sintez-gaz na osnove gorelochnykh ustroystv s ob'emnymi pronitsaemymi matritsami [Oxidative conversion of hydrocarbon gases to syngas in permeable volumetric matrices]. *Goren. Vzryv (Mosk.) — Combustion and Explosion* 7:53–58.

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