



Note from the field

The development of Green Chemistry in Russia as a tool to improve the competitiveness of chemical products [an opinion poll]



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ABSTRACT

The authors suggest that the World Trade Organization accession could be an important driving force for the implementation of sustainable development practices in the industry of certain countries. Developed economies are beginning to introduce green chemistry principles into their industrial processes and these practices are regarded as the best tool for promoting sustainable development. At the same time, the knowledge and practices originating from green chemistry principles are absent among enterprises of the Russian chemical sector. Russian chemical industry requires significant changes in order to adapt to the World Trade Organization requirements by 2017. In order to assess the impact of the World Trade Organization accession on the development of sustainable practices in the industry of certain countries, the authors launch a long-term assessment of the diffusion of ideas and practices of green chemistry principles among Russian chemical enterprises during the period of its adaptation to the World Trade Organization requirements. The current article introduces the concept of the potential role of the World Trade Organization as a driving force for sustainability transition and describes the results of the first sociological studies measuring the understanding of green chemistry principles within the management of Russian chemical enterprises. Final conclusions will be made on the basis of a series of interviews and quantitative research.

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1. Introduction

The ideas of sustainable development (United Nations Headquarters, 2010), emerged in the scientific community in the 1970s, and are included in the modern concepts of a green economy (UNEP, 2011), green industry (UNIDO, 2011), and green building (Bardhan and Kroll, 2011). The Twelve Principles of Green Chemistry, published by Anastas and Warner (1998), is the most important and widely used tool for integrating sustainability into chemistry and the chemical industry (Tundo et al., 2000). It is also assumed that green chemistry is the best tool for the promotion of sustainable development (Kirchhoff, 2005). The Twelve Principles of Green Chemistry provides a clear and comprehensive framework for establishing what is “sustainable” or “green” from the perspective of the chemical industry, and offers practical tools for the analysis, development and evaluation of chemicals and

chemical processes with respect to the goals of sustainable development (Anastas and Kirchhoff, 2002).

The idea of green chemistry began to spread throughout the Russian scientific community in the early 2000s. Several works were published in 2004/2005, encompassing all fields of green chemistry, including biomass use for sustainable chemical materials production, catalysis, chlorine-free chemistry and green organic synthesis (Lunin et al., 2004). In 2006, Moscow State University established the research and education centre “Chemistry for Sustainable Development – Green Chemistry” (Lomonosov MSU, 2006). Several works about the promotion of ionic liquid usage were published (Tarasova et al., 2010). In October 2012, Russia hosted the international exhibition “International Chemical Assembly – ICA-2012. Green Chemistry” and the panel discussion “Green Chemistry: Global Challenges – A request for innovation”. In 2012, the D. Mendeleev University of Chemical Technology of Russia established a professorial UNESCO Chair “Green Chemistry for Sustainable Development” (UNESCO Chair “Green Chemistry for Sustainable Development”, 2012).

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The green chemistry concept is expanding from the scientific environment into Russian industry, which is developing rapidly; according to estimates, industrial chemical production will continue increasing until 2015 and amount to 117.2% of current overall production, with chemical production increasing 117.5% (Russian Government, 2013a). We should also take into consideration the emerging Russian nanotechnology industry; a sustainability assessment is equally critical for its development (Fleischer and Grunwald, 2008). Several Russian chemical enterprises are beginning to recognize green chemistry as a competitive advantage for Russian products in domestic and foreign markets. The association of the chlor-alkali industry “RusChlor” considers green chemistry and green production methods the main direction for the development of industry in Russia. The fertilizer manufacturer “FosAgro” declares its readiness to produce green fertilizers, primarily characterized by low levels of heavy metals and radioactive elements (Oserov, 2013). RUSNANO supports a green economy and sees it as a priority for the development of modern Russia (Kolpachev, 2011).

The Russian government understands the need to introduce new, greener technologies, and regards the development of green chemistry as a major component of transition, as well as a top priority recognized at the highest level of government, both on a national (Donskoy, 2012; Russian Government, 2013b, 2013c) and international scale (Medvedev, 2012).

It is important to mention that the implementation of green chemistry in industry is taking place during a unique time: in 2013, Russia joined the WTO (State Duma, 2012). Integration into international trade under the WTO framework will be the main trend that will shape the face of Russian industry in the next few decades (Ivanov, 2012). The purpose of the Agreements on Technical Barriers to Trade (TBT) is to assure that a member state's regulations are based on sound science and do not create unnecessary non-tariff obstacles to trade with other members (WTO, 1994). To comply with the TBT, the Russian chemical industry will have a relatively short period of time to adapt to the conditions of international competition (i.e. compliance with green chemistry standards) or risk failing to compete. These changes in the production and use of chemicals should be pursued in a way that does not negatively affect the environment or population (Martyn Poliakov, 2002). We assume that the current drivers of and obstacles to green chemistry and engineering in China are essentially similar to those in Russia: e.g., competition between economic growth and environmental agendas, regulatory and bureaucratic barriers, the availability of research funding, technical barriers, workforce training, industrial engineering capacity, and economic and financial barriers (Matus et al., 2012). China joined the WTO in 2001, when green chemistry was not regarded as mainstream. Today, the widely shared view is that green chemistry will be at the core of the world's chemical industry in the future (Julie and Manley, 2008). The adaptation of the Russian chemical industry to the conditions of the WTO can be regarded as a unique process that will not be repeated in other parts of the world. For different industries and activities, a transition period from 3 to 8 years has been provided (Henry Meyer, 2011). Russian example offers a unique opportunity to observe how the WTO accession affects the penetration of sustainable practices into the particular industries. Having chosen the penetration of green chemistry ideas and technologies into the chemical industry as a sufficient indicator, we will trace the development of the aforementioned process for several years. In order to start such long term assessment and to evaluate the demand for green chemistry just upon joining WTO and the understanding of industry leaders of the potential of this tool to enhance the competitiveness of Russian products, the UNESCO Chair “Green Chemistry for Sustainable Development” (with the support from

the Ministry of Industry and Trade of the Russian Federation) has conducted a sociological study of Russian chemical enterprises.

2. Methods

In order to conduct the study, experts have developed a questionnaire. The results of the questionnaire contain general information on the respondents' attitudes towards a variety of issues: the problems and prospects of enterprise development arising from Russia's WTO membership; innovation policy, competitiveness and the prospects for enterprise development over the next 3–5 years; and green chemistry, how it is understood by respondents, and its role as a potential growth area for the Russian chemical industry. The first task of the survey is to clarify how respondents understand the concept of green chemistry. The second task is to assess the extent to which the principles of green chemistry are utilized in current processes. The third task is to evaluate the expectations from Russia's entry into the WTO and assess the impact of WTO accession on innovation policy organizations.

This questionnaire was supported by a letter from the Ministry of Industry and Trade of Russia addressed to the CEOs of Russian chemical enterprises with a request to answer the questions proposed.

The subsequent survey of responses received indicated that 104 companies are engaged in the extraction and enrichment of chemical raw materials (rock phosphate, apatite, potassium salts), the production of mineral salts, alkalis, inorganic acids, chlorine, ammonia, organic synthesis products, petroleum products, carbon black, fertilizers, chemical plant protection products and chemical feeding stuffs, paints, varnishes, polymers and plastics, fiberglass, synthetic rubber, chemical agents and high-purity materials and catalysts, photographic materials, medicinal products, household chemicals, rubber, asbestos products, explosives, ammunition and special chemicals. Also, the survey included the pulp and paper industry, ferrous and non-ferrous metallurgy, and manufacturers of personal protective equipment.

3. Research results

The study found that the stance of Russian companies towards joining the WTO is very ambiguous (Fig. 1). The survey showed that 41% of chemical enterprises consider WTO accession as positive, with only 18% giving negative responses. It should be noted, however, that 41% reported difficulty in answering this question. Most of the positive responses were given by enterprises that manufacture products mainly intended for Russian markets and/or industrial use (52% and 47%, respectively). The highest percentage of

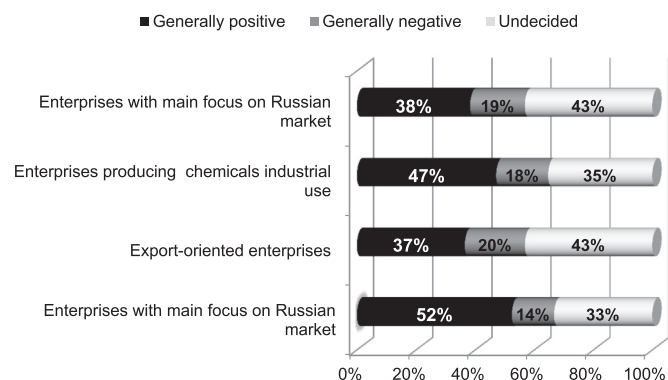


Fig. 1. Answers of enterprises to the question “How do you assess the decision to join the WTO in general?”

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