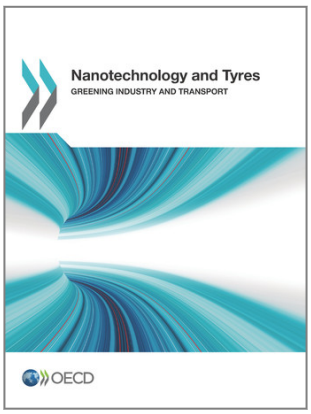
OECD *Multilingual Summaries*
Nanotechnology and Tyres
Greening Industry and Transport

Summary in English



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The demand for vehicles is expected to double by 2030, putting enormous pressure on the sustainability of the transport sector. A number of measures should be taken to manage this increase and prevent its massive impact on the environment, society and the economy. These measures include, for example: reducing the use of personal vehicles by increasing the availability of public transport services, developing greener vehicles, and providing more sustainable tyres. Indeed, tyres significantly contribute to the overall environmental impact of the transport sector due to the high levels of natural resources used in their production (for example, natural rubber and synthetic rubber derived from fossil fuels) and the effect of the rolling resistance of tyres on vehicle fuel consumption.

New technological solutions are now being researched to improve the sustainability of tyres and nanotechnology is at the frontline of technologies that could help contribute to this goal. The use of new nanomaterials in tyre production is expected to help improve the sustainability of tyres throughout the life cycle of the product. New nanomaterials have the potential to decrease rolling resistance (improving fuel consumption) and improve wear resistance (increasing tyre lifetime) while maintaining wet grip and existing safety levels. Yet many of the policy implications of the use of nanotechnology in tyres are still unclear. In particular, uncertainty over environmental, health and safety (EHS) risks remains and specific risk assessment frameworks for the use of nanotechnology in tyre production are missing to assess those risks efficiently.

Key findings and messages

Industry-specific guidance is missing for assessing the environmental, health and safety risks in the development of new nanomaterials in tyre production: this study provides guidance for risk assessment for the use of nanotechnology in tyre production.

New nanomaterials offer promising avenues for future innovation, which could contribute towards the sustainability and resource efficiency of the tyre industry. However, uncertainty over the EHS risks appears to be a main and continuous concern for the development of new nanomaterials in tyre production, even for some of the new nanomaterials that are close to market. The difficulties in characterising the EHS risks lead to uncertainty in the way nanotechnologies are being regulated, which seems to affect innovation at all stages of development.

While generic EHS good practice guidance can serve as a starting point for the tyre industry when addressing the EHS risks, the lack of industry-specific guidance for assessing the risks associated with the use of nanomaterials in tyre production constitutes an important gap. To address this gap, a risk management framework was developed as part of this study that can be used specifically to develop site- or company-specific risk assessments or risk management strategies for using nanomaterials as additives in tyres.

This gap in industry-specific guidance also seems to affect other industry sectors using nanotechnology. A possible next step could be the development of further industry-specific guidelines to help improve the effectiveness of the implementation of new nanomaterials in other sectors.

Policies to support research in the environmental, health and safety risks, as well as those to support the commercialisation of nanotechnology research results, are critical to foster responsible innovation in the tyre sector.

Many policies have an impact on the uptake of new nanomaterials in tyre production, in particular those policy instruments aiming to bring clarity to the assessment of the EHS risks. This study demonstrates that policies to foster knowledge sharing and co-operation concerning the responsible development of nanotechnologies play a critical role in managing uncertainty and act as a clear driver of innovation in the tyre industry. Public investment more generally was seen as a critical lever to address issues linked to the commercialisation of research results and the development of research into the societal and environmental issues associated with the development of nanotechnology.

Policy instruments aimed at greening transport and increasing consumer awareness are important drivers of sustainable innovation in the tyre industry, including research into new nanomaterials.

Innovation in the tyre industry is driven by three main market factors that are affecting different steps of the supply chain: the demand for better performance and "greener" tyres; the competition between tyre manufacturers; and major economic and environmental issues directly affecting tyre production, such as resource scarcity and the rising costs of raw material and oils.

The growing use of policy instruments for fostering fuel economy and reduction of CO2 emissions for new vehicles, such as vehicle fuel efficiency standards, are driving demand for low resistance tyres. Specific legislation to reduce the impacts that tyres have on vehicle fuel efficiency is relatively recent, with minimum standards for rolling resistance being a key example. In order to influence demand and steer innovation toward more sustainable and cost-efficient tyres, improvements in tyre performances should be made clearly visible to consumers. Tyre labelling and rating systems are key instruments to that end. Increasing consumer awareness is an important enabling factor that allows the actual benefits to be perceived and understood. All of these instruments act as drivers for technological innovation in the tyre industry.

A range of analytical tools should be used to gain better insight into the socio-economic and environmental impacts of nanotechnology applications.

Estimates concerning the range of potential future impacts associated with the uptake of new nanomaterials in tyres are important inputs into the design and management of the various policy instruments that directly or indirectly affect innovation in tyres. A number of analytical tools were used in this study to explore the socio-economic and environmental impacts of nanotechnology when used in tyre production: a cost-benefit analysis, a multi-criteria analysis and a life-cycle analysis.

The study concluded that highly dispersible high surface area (HD-HS) silica and nanoclays, the nanomaterials explored in detail in the study, could generate significant net benefits for consumers whilst also reducing environmental impacts. However, accurate impact assessments are often difficult to attain

because of uncertainty over the EHS risks. Quantitative cost-benefit analysis functions best when impacts can be accurately assessed, and uncertainty over the EHS risks means this is not currently practical. Benefits must then be weighed against the possibility of introducing a new and uncertain costs related to the potential EHS risks of nanotechnology use.

The life-cycle analysis (LCA) used in the study showed that environmental improvements over the lifecycle of the product, e.g. in tyre production and use, could be achieved over a range of environmental impact categories by using HD-HS silica and nanoclay. Although the savings in the production stage are relatively high in percentage terms, the magnitude of the savings is much greater during the in-use stage. However, data availability and accessibility issues affected the use of LCA, either because quantitative data had not been gathered or because the information and data needed to complete the analysis were considered to be confidential. Because of this lack of primary data, this study makes no claim to provide definitive results for HD-HS silica and nanoclay, or to make comparative statements for these products. Recommendations to improve the LCA framework for assessing the relative impacts of baseline and nano-enabled tyres, however, are included in the study.

Collaboration between governments and industry is critical to address the specific challenges raised by the introduction of new nanomaterials in different industry sectors.

Using the analytical tools mentioned above requires access to good quality data at the policy level and at the corporate level; this study benefited greatly from joint efforts between governments and industry stakeholders to provide such access. Without such collaboration, addressing the specific challenges raised by the introduction of new nanomaterials in different industry sectors would have been impossible. Similar collaborative approaches may therefore be beneficial for other industry studies confronted by data collection difficulties.

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