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A fit transportation

Recent policies are promoting the conditions for a transformation of the transportation sector worldwide. Here, we look at the example from the European Union and reflect on the opportunities that initiatives such as Fit for 55 represent for catalysis science.

Refilling a car with gasoline at the fuel station is an image very familiar to billions of people worldwide. In the last few years, however, a new intruder has made its way through our streets and the sight of electric cars, plugged via thick black cables to solitary recharging stations, has become more and more frequent. In a report from 2021, the International Energy Agency suggested that the number of circulating electric cars passed the mark of ten million in 2020[1]; the amount is certainly important and it keeps growing, but still represents only ~1% of the overall vehicles currently in operation worldwide.

While the forecasts for the sector are very positive, this year, the European Union has set the conditions for a change of pace in the transformation of the automotive sector by passing a resolution that introduces a target of 100% CO_2-emission reduction for new cars from 2035. This initiates de facto the phasing out of fossil fuel vehicles. The plans are part of Fit for 55, a larger package of measures conceived to reduce emissions within the European Union by 55% by 2030 – with respect to 1990 levels – and reach climate neutrality by 2050. This very ambitious program in fact targets the transportation sector as a whole as one of its pillars, and includes measures that will transform both air and maritime transport as well. In these areas, the focus is on increasing access to clean electricity supply and intensifying the utilization of synthetic low-carbon and renewable fuels[2].

The plans have inevitably been met with some criticism, and some of the biggest sceptics have highlighted limitations for a few key enablers of Fit for 55. Take electrification as an example, which is expected to play a major role. While many automobile producers are taking the odds, having announced independently their plans to discontinue the production of internal combustion engine cars – which suggests electric cars are mature enough to replace them – critics emphasize the high costs of the vehicles – still unaffordable for many people – and the lack of a sufficiently developed charging infrastructure. Moreover, renewable energy options to produce the required electricity are limited, while the market of traditional energy carriers has been facing a moment of unprecedented instability in the past months, complicating the overall picture.

Despite the uncertainties that inevitably accompany such a complex transition, however, it is clear that Fit for 55 offers a remarkable opportunity to decarbonize the transportation sector, and is hopefully going to be matched by similar initiatives worldwide. While such schemes provide the necessary legislative push, research and technological development are expected to bolster and accelerate such transformation.

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We, at *Nature Catalysis*, have been following the field of transportation over the past years and consistently give space in our pages to selected advances in catalysis that have the potential to innovate the automotive, maritime and aviation sectors.

As mentioned above, Fit for 55 sets on electric cars as the key technology to achieve its objectives. Renewable electricity, however, is only produced to a limited extent in the European Union – around 20% of the overall energy mix up to 2020[3]. Therefore, a rapid expansion of production capacity will be crucial, but it must be accompanied by the implementation of mature storage technologies, capable of accommodating production fluctuations – an intrinsic characteristic of renewable energy based, for example, on wind or Sun. Moreover, storage is critical for the effective distribution of this decarbonized electricity. Synthetic chemical fuels produced with renewable energy are certainly going to be part of this equation. Such renewable fuels can thus be used as propellants for vehicles based on the appropriate technology. In this regard, two years ago we looked at developments in the area of hydrogen transportation in Europe and highlighted how fuel-cell vehicles are an important part of the next generation transportation fleets if climate targets are to be met.

Most certainly, a single technology is not going to be sufficient to decarbonize the transportation sector, and a good mix of ever-improving solutions is going to be crucial, especially during the early stages of such a transition. Catalysis scientists are well placed to advance different relevant areas, whether it be by designing more efficient and cheaper catalysts for the electrodes of fuel cells, by developing scalable solutions for the production of CO_2-based aviation fuels or by other means. In this spirit, we will continue to look with attention at those studies that either offer a fresh conceptual perspective in such areas, or bring the potential to impact the practicality of the next-generation means of transportation.

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