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Automotive graphene based nanocomposites

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The automotive industry is widely viewed as being the industry in which the greatest volume of advanced composite materials will be used in the future to produce light vehicles. Now-a-days, several advanced materials are widely used in automotive industry. Because of its multifunctional properties and promising applications, many expectations in composite materials are related to graphene. However, no application of graphene based materials is currently marketed in the automotive sector. Therefore, research activities are under development to study the potentiality of these systems and all the value chain of automotive needs to be involved in this effort. One of most challenging aim is the economic impact of the innovative structures on the vehicle market, all the value's chain have to address their effort to get the final cost of the innovative products as low as possible. The present initiative provides a summary overview on graphene related materials (GRMs) for automotive applications and investigates efficient ways to integrate graphene as polymer reinforcements within composite materials for energy efficient and safe vehicles (EESVs). The idea is based on the concept oriented light weight design aiming for combination of light structures with novel multifunctional materials. For such a purpose, GRMs are addressed with respect to some challenging factors, for instance the large scale production of graphene or the non-existence of constitutive material models for high performance structural applications like crash worthiness. Therefore, accurate material models need to be developed to support simulation of structural design for these vehicles. A focus on the hierarchical modelling of GRMs with an emphasis on the multiscale constitutive behaviors of each material phase is elaborated in the framework of the graphene flagship to well understand such limitations for a full applicability of graphene. It is anticipated that this initiative will advance innovative lightweight graphene nanocomposites and their related modelling, designing, manufacturing, and joining capabilities suitable for automotive industry which requires unique levels of affordability, mechanical performance, green environmental impact and energy efficiency. This leads to complete understanding of the new graphene nanocomposites and their applicability in high-volume production scenarios.

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