

RECENT RESEARCH RESULTS IN COMPOSITE MATERIALS AND ADHESIVE APPLICATIONS FOR VEHICLE LIGHTWEIGHT

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ABSTRACT: Vehicle weight reduction (and in turn reduction of fuel consumption, noxious gas and greenhouse gas emissions), manufacturing costs and riding comfort are pushing toward relevant growth the amount of polymeric materials employed in modern cars. At the same time the main performance of the car (and in particular safety and NVH comfort) should be maintained. In order to pursue this trend, it is important to carry out research and innovation on new polymer-based materials, with a high structural performance to weight ratio to replace standard materials, such as mild steel, for structural components. The base costs of composite materials are still relatively too high, therefore research activities are needed to reduce manufacturing costs of composite components. On the other hand the use of composites offer advantages not only in terms of lightweight but also in terms of parts integration, TTM reduction, etc. Innovative components can take advantage from new materials but need for proper design rules and proper manufacturing technologies.

Cycle times and production volumes are key factors. The production value chain and the research have to work in order to overtake some technological limits (joining technologies, recyclability, repairing, safety, costs, ...) for a wider employment of lightweight materials.

This paper is presenting some recent results in the design of vehicle components with composite materials and is also presenting some recent achievements in the use of thermoplastic adhesives, nanomodified by ferromagnetic particles, sensitive to the electromagnetic field finalized to speed up both the manufacturing and the dismounting processes.

KEY WORDS: lightweight, composite material, CO2 emission reduction, adhesive joints, nanomodified adhesives

REZULTATI ISTRAŽIVANJA U OBLASTI PRIMENE KOMPOZITNIH I ADHEZIVNIH MATERIJALA KOD LAKIH KONSTRUKCIJA VOZILA

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REZIME: Smanjenje težine vozila (i zauzvrat smanjenje potrošnje goriva, emisije izduvnih gasova i štetne emisije gasova staklene bašte), proizvodnih troškova i poboljšanje udobnost su ciljevi koji utiču na širu primenu polimernih materijala u savremenim automobilima. Istovremeno treba zadržati najvažnije performanse automobila (posebno sigurnost i NVH komfor). U cilju postizanja ovih zahteva, potrebno je sprovesti istraživanja i primeniti inovacije sa novim materijalima na bazi polimera, koji imaju visok odnos strukturnih performansi u odnosu na težinu, kojima treba zameniti standardne materijale, kao što je čelik, naročito kod strukturnih komponenata. Osnovni troškovi kompozitnih materijala su još uvek relativno previsoki, zato su potrebna istraživanja u cilju smanjenja troškova proizvodnje komponenata od kompozitnih materijala. Sa druge strane, primena kompozitnih materijala daje prednost, ne samo u smislu lakih konstrukcija, ali i u pogledu delova za

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spajanje, smanjenja TTM, itd. Inovativne komponente mogu iskoristiti prednosti novih materijala, ali je potrebno primeniti odgovarajuća pravila projektovanja i odgovarajuće proizvodne tehnologije. Vreme i obim proizvodnje su ključni faktori. Proizvodni lanac i istraživanja moraju da se usklade kako bi se prevazišla neka tehnološka ograničenja (tehnologije spajanja, reciklaže, popravke, sigurnost, troškovi, ...) za širu primenu lakih materijala.

U ovom radu prikazani su rezultati istraživanja u razvoju komponenata vozila od kompozitnih materijala, i neka novija dostignuća u primeni termo-plastičnih adhezivnih materijala, nano-modifikovanih fero-magnetnim česticama, osetljivim u elektromagnetnom polju kako bi se ubrzali procesi proizvodnje i rasklapanja.

KLJUČNE REČI: lightweight, composite material, CO2 emission reduction, adhesive joints, nanomodified adhesives