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## Green Engineering Solutions at Propulsion of Passenger Cars

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### Abstract

This paper processes data disclosed by the former and modern sources of literature and presents a study of the current state of art in the field of automotive drives. The paper goes through the different possibilities of storage the alternative energy on a vehicle: electrical energy in lithium based batteries, transformation of solar energy by photovoltaic panels, using of nuclear energy, but each of them presents a lot of disadvantages. Recently promising results appeared using the hydrogen in combination with fuel cells. This is not a new think, but the way of the realization of safety passenger cars offered on the market gives us the hope of a real green engineering solution. We hope this paper contributes to the spread of this technology.

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### 1. Introduction

In the Fig. 1. we can observe a strong correlation between the temperature of the Earth and the content of CO<sub>2</sub> in the atmosphere [1]. We could think what we hear in the media that CO<sub>2</sub> comes only from the burn of the fossil fuels. If we analyze the phenomena we observe that there are many other sources of CO<sub>2</sub> as it is shown in Fig. 2.

The human activity is divided into [2]:

- industry 19%
- agriculture 15%
- power plants 24%
- house hold 23%
- transport 19%

Inside of transport there are [2]:

- shipping 11%
- flight 16%
- trucks 31%
- passenger cars 31%
- others 11%

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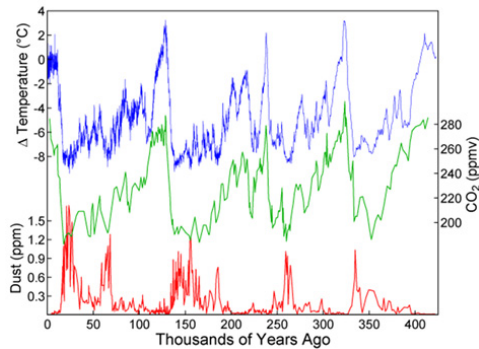


Fig. 1. Correlation between the temperature of the Earth and CO<sub>2</sub> [1].

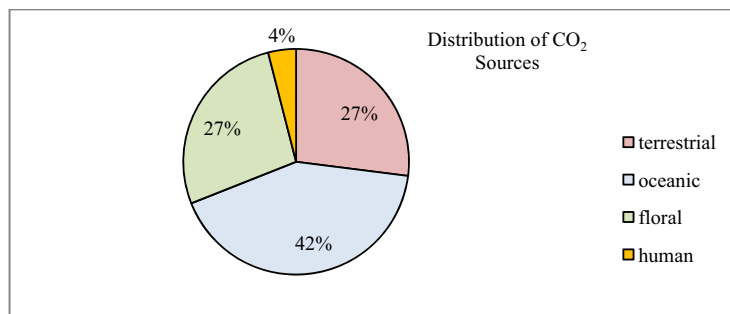


Fig. 2. Distribution of sources of CO<sub>2</sub> [2].

We can observe that the passenger cars were responsible only for a small percent (totally  $4\% \cdot 19\% \cdot 31\% = 0.23\%$ ) of the total emission of CO<sub>2</sub> in year 2005. Why do we think that we have to change fossil fuel based power source of the car? Of course the sources are limited and sooner or later it will run out of stocks.

## 2. Hydrogen as combustible

A possibility is to use other fuel in the internal combustion engine. Any kind of HC is burned it will result H<sub>2</sub>O and CO<sub>2</sub> even if comes from different kind of plant, biomass, biogas and so on. It remains the H<sub>2</sub> that can be introduced direct into internal combustion engines and burned that will result only H<sub>2</sub>O that is water. This procedure is written in different literatures [3], but it was not spread widely because a lot of reasons: the H<sub>2</sub> is a very active gas, it is very difficult to store, a small leakage nearby seals can cause explosions, in case of an accident it is a source of explosion, it burns without flames, etc. Until now there are three main ways for the storage of the H<sub>2</sub>:

- in gaseous state: at high pressure (700 bar) is very dangerous, it needs big volume and a heavy weight equipment;
- in liquid state: it could be reasonable from the point of view of energy density (not so heavy equipment, not to big volume), but it needs very low temperature (-253°C) that requires too high energy investment;
- in metal-hydride tank: the hydrides are bonded by metal powders through an exothermic chemical reaction. It is characterized by low energy density and high costs.

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