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June 1, 2009

Dr. Marijke Bekken
Staff Air Pollution Specialist
Clerk of the Board
California Air Resources Board
10011 I Street
Sacramento, California 95814

Dear Marijke:

(By Priority Mail)

RE: COOL CAR STANDARDS AND TEST PROCEDURES

PUBLIC RECORDS ACT: This letter and the attachments to it may be released to any person requesting it, including the press. There is no confidential information in any of this material.

As I spoke to you last week, I am opposed to the Cool Car Standards and Test Procedures as proposed by the California Air Resources Board. It is not that I am opposed to the standard per se.

What the standards would do would preclude the adoption of Neodymium Oxide doped windshields as a safety measure to be installed on vehicles.

Neodymium Oxide, as a component of glass, selectively filters out yellow light. There is a very sharp absorption band in the yellow between 565 and 595 nanometers.

I hold United States Patent Number 6,459,652, issued September 17, 2002, "Neodymium Oxide Doped Motor Vehicle Windshield and Safety Glazing Material. I have also filed international patents in the European Union, China, Korea, Japan, and the Czech republic.

A copy of this patent is included as an attachment to this letter. This patent may also be accessed through my website at www.danielkarpen.com.

As written in column 1, lines 31 to 34, of the patent:

It has long been recognized that the visual discomfort from headlights of oncoming vehicles from the opposite direction and from the rising or setting sun is a major problem that has been unrecognized up to this time.

The patent provides the scientific and technical basis for the invention. The chemistry of Neodymium Oxide doped glass is discussed in the patent, as well as the properties of Neodymium Oxide doped glass. In column 6 of the patent, a discussion is provided of the optical properties of Neodymium Oxide doped glass. This discussion continues through columns 7 to 9.

Graphs are provided in the patent showing the absorption of yellow light by Neodymium Oxide in glass.

The patent claims are made clear in Claims 1 to 9 describing a glass with a light transmission coefficient of 70 percent containing up to 0.0225 grams of Neodymium Oxide per square centimeter of glass surface area for use as windshield material. Other claims describe the use of Neodymium Oxide in safety glazing material (glass used for side and rear windows), and in bullet resistant shields.

The glare problem

A question is asked: How significant is the glare problem in causing motor vehicle crashes?

This questions is answered in two ways. First, two articles are enclosed from Newsday, Long Island's daily newspaper, describing two deadly crashes, both caused by sun glare, in one accident, there was a fatality, in the other accident, a critical injury.

A comprehensive study of distracted drivers was conducted by Virginia Commonwealth University. They found that of the 2,792 crashes, 18 were due to lighting conditions attributable to glare or sun. See page 55 of the report. Thus, .645 percent of all crashes were due to glare or sun problems. I regard this percentage as being high. A complete copy of this report is attached to this material.

Research on vision with Neodymium Oxide doped glass

I obtained a research grant from the Transportation Research Board, and with Dr. Gordon Harris, a research optometrist, conducted research on the visual properties of Neodymium Oxide doped glass. This research was published as an SAE Technical Paper number 2005-01-0440, entitled "Recent Research on Neodymium Glass as Applied to Headlights, Rear View Mirrors, and Windshields", and presented at the 2005 SAE World Congress in Detroit, Michigan held between April 11-14, 2005.

Our research consisted of a series of 9 vision tests done under clinical conditions in an optometric examination room, followed by a road test with standard headlights and Neodymium Oxide doped headlights.

One of our tests (Test 1) compared the ability of persons to read lettering on a standard Snellen eye chart through a standard windshield glass having a light transmission of 78.6 percent compared with a sample of Neodymium Oxide doped glass having a total transmission of 70 percent. Our tests no significant difference, even though the Neodymium Oxide doped glass had a lower light transmittance.

A more difficult vision task is being able to read a license plate at night between two glaring headlights. Test 3 showed a slight but statistically significant improvement in vision with the Neodymium Oxide doped glass as compared with standard windshield glass.

Test 5 showed that yellow turn signals would be visible though the Neodymium Oxide doped glass as well as the standard windshield glass.

Test 7 showed that depth perception abilities did not change even though the Neodymium Oxide doped glass had a lower light transmission than the standard windshield glass.

Test 9 showed a significant reduction in the after image decay time between the Neodymium Oxide doped glass and a neutral density filter. The mean decay time for the after image through the Neodymium Oxide doped glass was 17 percent lower.

Test 10 was a road test of Neodymium Oxide doped headlights compared with standard headlights.

SAE Paper 2002-01-0011

An earlier SAE paper determined the amount of Neodymium Oxide to be added to glass to have a improvement in the de Boer glare scale. Adding 0.0221 grams of Neodymium Oxide per square centimeter would result in a de Boer score of 4.523 which is slightly below just acceptable. As noted in the paper, most windshields are sloped at an angle. At this angle, the motorist would see through .3125 Kgs/square meter of glass surface. This amount of Neodymium Oxide would provide reasonable glare control utilizing a minimum of the rare earth compound.

Cost of Implementation

As discussed in SAE paper 2002-01-0011, a windshield 30 inches by 54 inches would require approximately 231 grams of Neodymium Oxide to achieve a light transmittance of 70 percent. At a cost of \$20.00 per Kilogram of Neodymium Oxide, the cost per windshield of the Neodymium Oxide is \$4.62. This cost is significantly less than adding solar infrared materials to automotive glazing as described in the Staff Report: Initial Statement of Reasons for Rulemaking. The mark-up costs for adding Neodymium Oxide to a windshield have not been estimated.

A copy of SAE paper 2002-01-0011 is attached to this letter.

Status of the Invention

The necessary R&D to implement Neodymium Oxide glazing to vehicles is minimal. The amount of Neodymium Oxide doping necessary to achieve a total light transmittance of 70 percent is known. It would be necessary to dedicate a glass furnace and a float line to manufacture Neodymium Oxide doped glass in large quantities.

Glass manufacturers such as Asahi Glass, Guardian, Pilkington, Saint Gobain, and Zeledyne are aware of the patent, and have been shortly after the patent was issued by the U. S. Patent Office.

Chrysler, Ford, General Motors, Toyota, and Honda have been aware of the patent.

Technical objection to Cool Car Standards and Test Procedures

I have spoken verbally to the windshield manufacturers. All of them have told me verbally that if solar infrared control materials are incorporated into the windshield, it become impossible to incorporate Neodymium Oxide in the glass due to Federal safety standards for light transmission for windshields.

My own thoughts

I have taken a sample of Neodymium Oxide doped glass, with a 70 percent light transmittance, and I have held it up to the rising and setting sun, and there is a huge reduction in glare.

I would have no objection whatsoever to the proposed regulation if windshields were taken out of the regulation, and it would apply only to side windows, rear windows, and sun roofs.


I have never owned a vehicle with an operable air conditioning system. When I park it in hot weather, I leave the two front seat windows open two inches to ventilate the vehicle.

Perhaps the California Air Resources Board needs to begin a public awareness campaign to get people to leave the windows open a little bit to ventilate their vehicles.

How about a sticker on the dash ?

Here is another idea: Put in thermostatically controlled front seat windows that would automatically open 2 inches when the internal space temperature of the vehicle is too high.

Yours truly,

A handwritten signature in cursive script that reads "Daniel Karpen". The signature is written in dark ink and is positioned above the printed name and title.

Daniel Karpen
Professional Engineer

DANIEL KARPEN

PROFESSIONAL ENGINEER & CONSULTANT, P.C.

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June 9, 2009

Monica Vejar
Clerk of the Board
California Air Resources Board
10011 I Street
Sacramento, California 95814

Dear Monica:

RE: URL LINKS FOR MY ATTACHMENTS - LETTER OF JUNE 1, 2009

U. S. Pat. No. 6,459,652

The easiest way to get the link is to go to www.danielkarpen.com,
click on patents, and find it there.

[http://patft.uspto.gov/netacgl/ngh-Parser?Sect1=PTO28&Sect2-HITOFF
&P=1&U=%2Fnetahmt1%2FPTO%2Fsearch=bool.ht](http://patft.uspto.gov/netacgl/ngh-Parser?Sect1=PTO28&Sect2-HITOFF&P=1&U=%2Fnetahmt1%2FPTO%2Fsearch=bool.ht).

Or, go to ~~uspto~~.gov, and search for U. S. Pat. No. 6,459,652.

SAE papers. SAE charges a fee to down load them.

http://www.sae.org/servlets/productDetail?PROD_TYP=PAPER&PROD_CD=2002-01-0011
http://www.sae.org/servlets/productDetail?PROD_TYP=PAPER&PROD_CD=2005-01-0440

Virginia Commonwealth University Distracted Drivers Study.

Go to Google and search "Distracted Drivers""Virginia Commonwealth University"

http://www.dmvnow.com/webdoc/pdf/distracted_driver_report.pdf

The two Newsday articles may or may not be accessible on the web.

Please call me at the above number if you have any questions.

Yours truly,



Daniel Karpen