

Activities and Perspective for cool surfaces in Japan

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Masaaki OKABE Ph.D.

Manager, Corporate Planning Group, Office of the President

AGC Asahi Glass Co., LTD

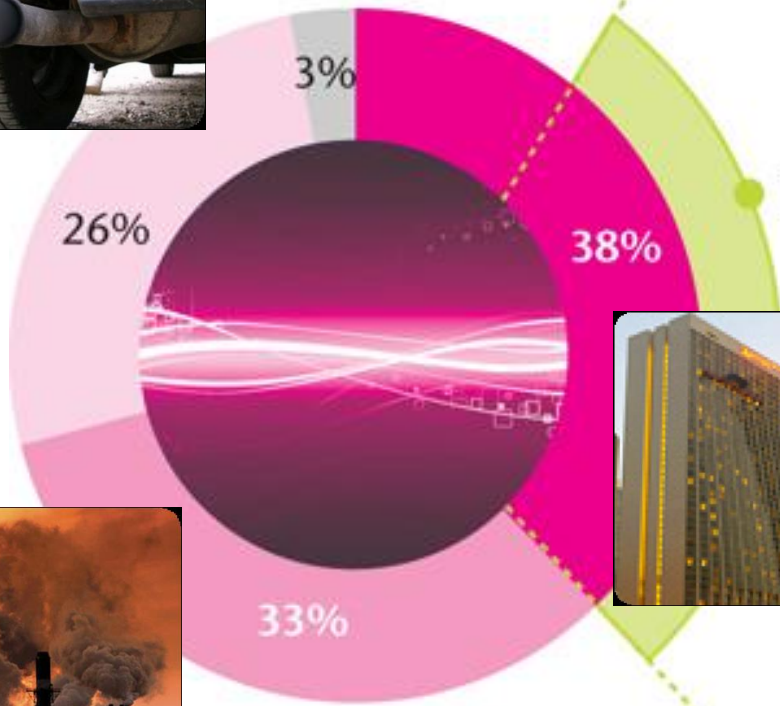
Cool surface activities in Japan




- Energy saving windows
- Cool roofs
- Cool pavements

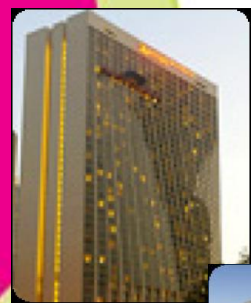


Buildings are Largest Consumers in the world

Buildings are the "invisible" large consumers of energy and emitters of CO2



- Buildings 
- Industry 
- Transport 
- Other

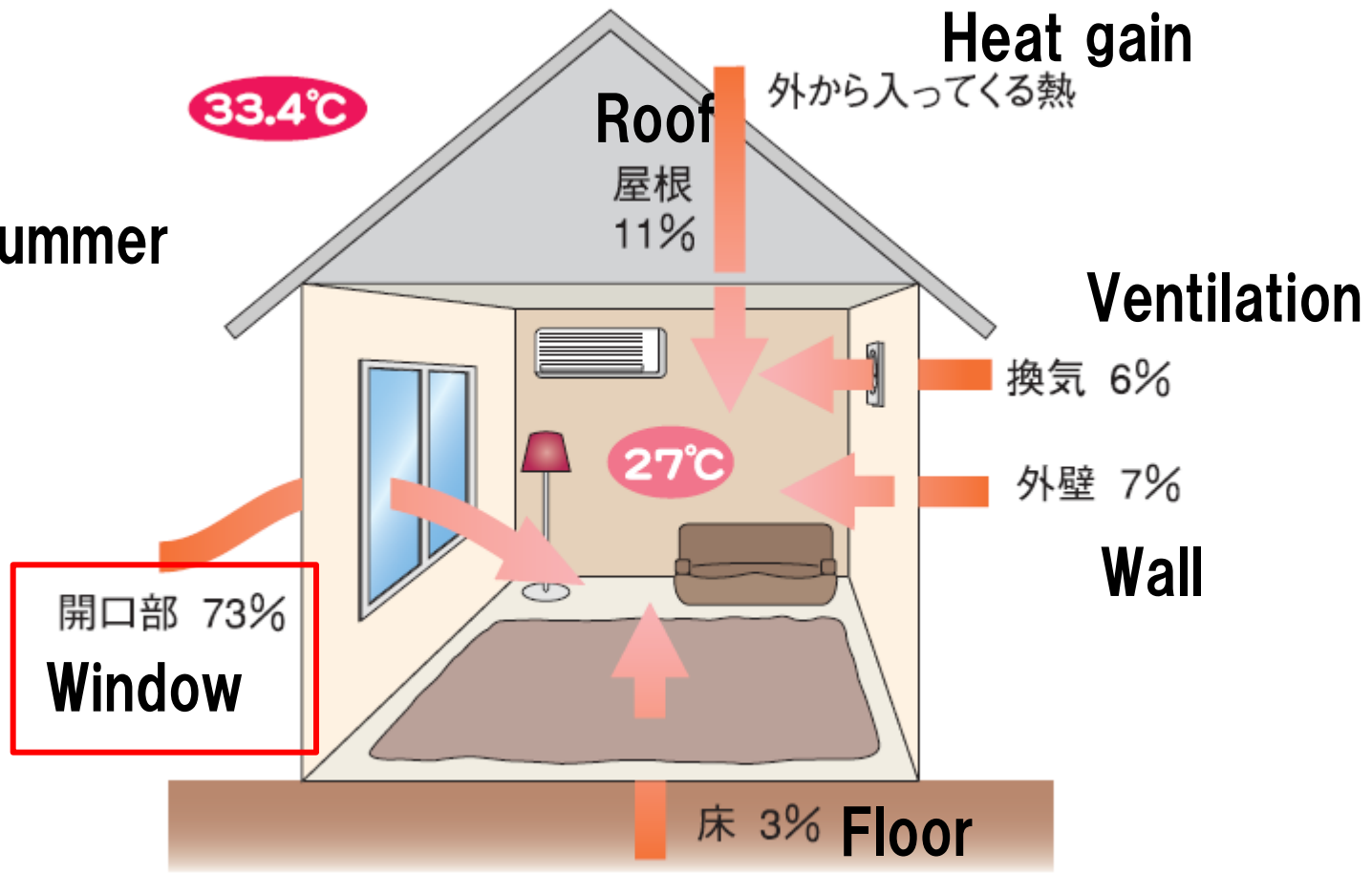


Source: IEA "Worldwide Trends in Energy Use and Efficiency", (2008)

Single glazing windows in warm area



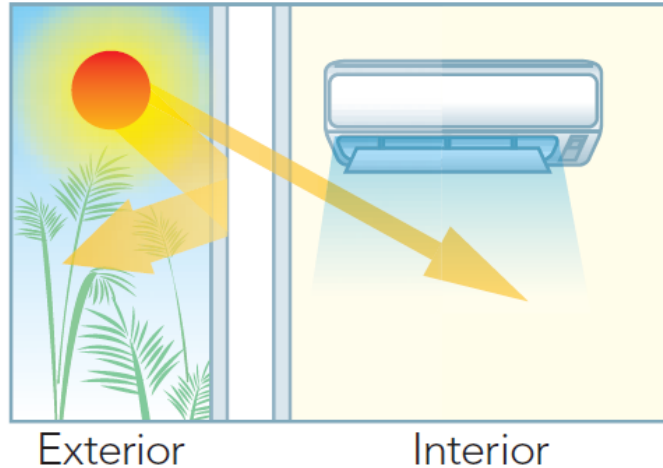
Summer



Source: Japan Construction Material & Housing Equipment Industries Federation

Technology for warm area

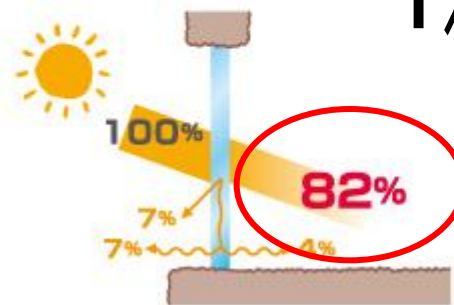
In warm/hot regions:
In summer, effectively shields solar radiation and heat from the outside (solar control effect), reducing air conditioning use.



http://www.agc.com/ir/library/2012/pdf/2012j_complete.pdf

エコガラスの日射量

<1枚ガラス>

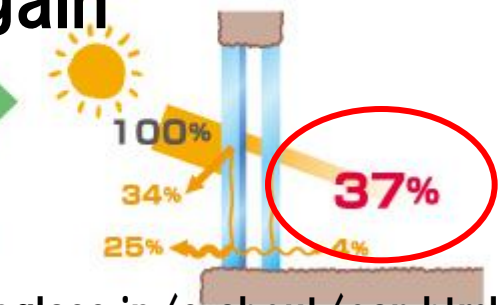


1/2 Heat gain

エコガラスの場合

日差しの暑さを
約2分の1に

<エコガラス>



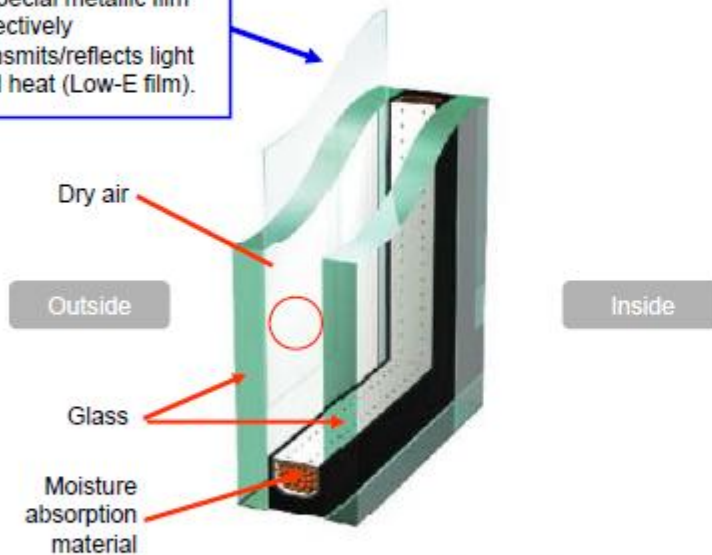
http://www.ecoglass.jp/s_about/can.html

There is major potential in Japan.

Ecoglass (Low-E Insulated Glass Units)

Ecoglass

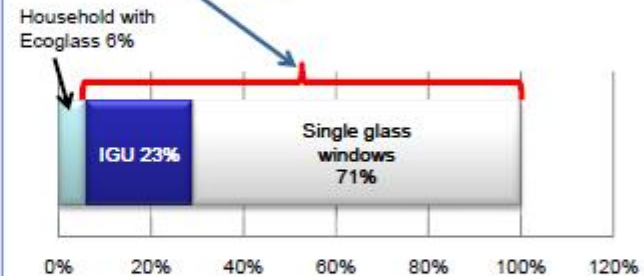
A special metallic film selectively transmits/reflects light and heat (Low-E film).



AGC achieved a greater heat insulating/shielding performance by placing a special metallic film (Low-E film) between the IG unit.

Energy-saving with Ecoglass (in Japan)

If every household in Japan uses Ecoglass,



Household Ecoglass use in 2010 (estimated based on approx. 5000 households in total)

We can save the electricity equivalent to the amount generated by two nuclear reactors*.

*100 million kilowatt/reactor



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~2012 Cool roof coatings related standardization activities in JAPAN

(Paint industry)

- Dec. 2010: JPMA 27 (High durability paint for outdoor) ; Association Std.
- (Registered as green purchasing product by ministry of environment)
- July 2011: JIS K 5675 (High solar reflectance paint for roof)

(Pre-coated metal Industry)

- June 2012: JIS G 3312, 3318, 3322 Amendment (Add Cool roof grades)

(Water proof seat Industry)

- Dec. 2008: KKR S-001 (High solar reflectance water proof seat) ; Association Std.
- Apr. 2010: (Registered as green purchasing product. By ministry of environment)

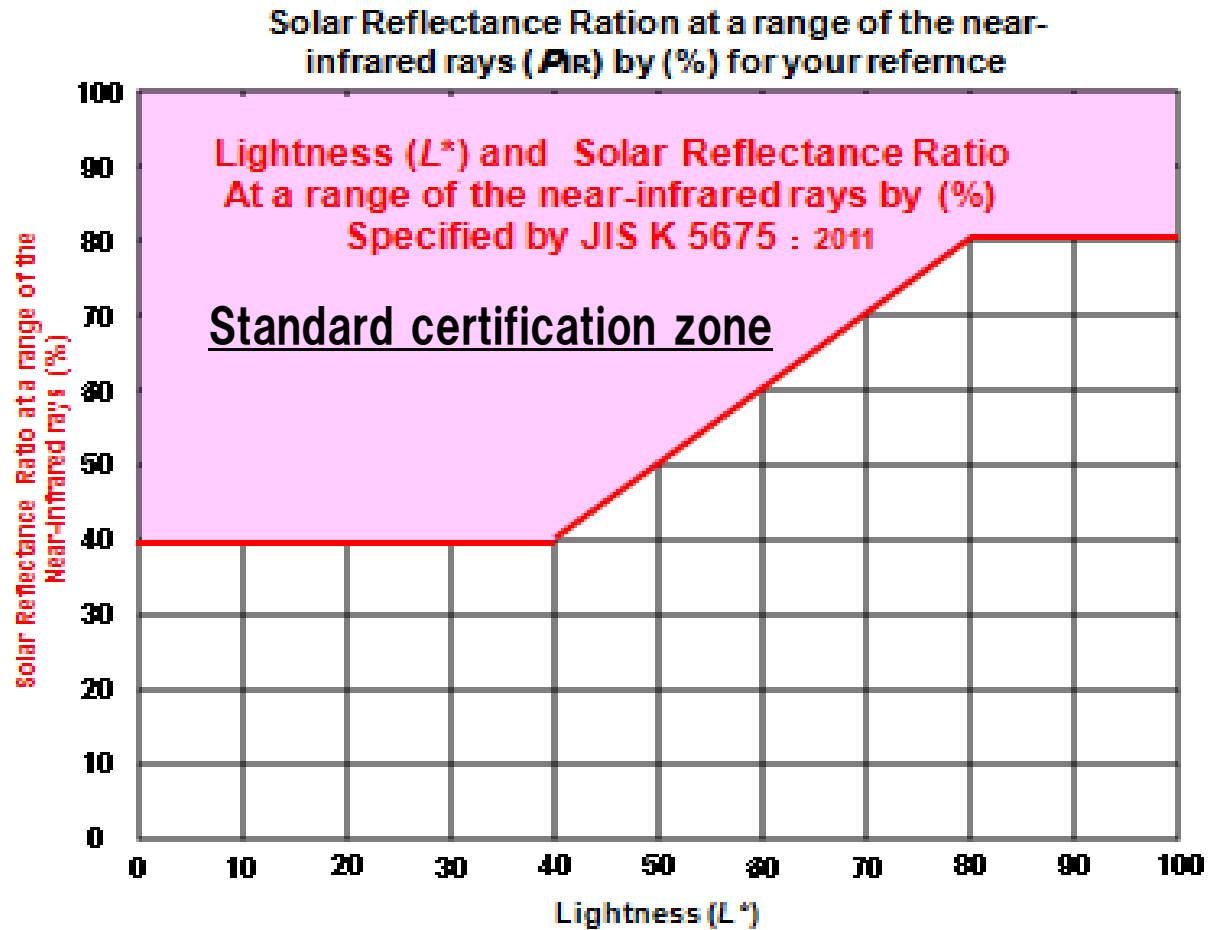
(Ceramic roof tile Industry)

- 2012: Cool roof tile commercial products has been introduced
- 2011: Demonstration project by Ministry of environment

(Pavement material Industry)

- 2010: Cool pavement spec. was filed in “Civil engineering construction manual of Yokohama city)
- 2011: Cool pavement have been listed as Continuous demonstration Item by MILT
- 2012: Cool pavement spec. was filed in “Road repair work technical report in Tokyo”

JIS and policy support



Cool Roof Coatings as energy saving measures

Demonstration project in Thailand 1st Year Report (2012)

Bird's eye view of the test site



2012 Technical Cooperation Project in Thailand on High Solar Reflectance Paint as an Effective Energy Saving Technology.



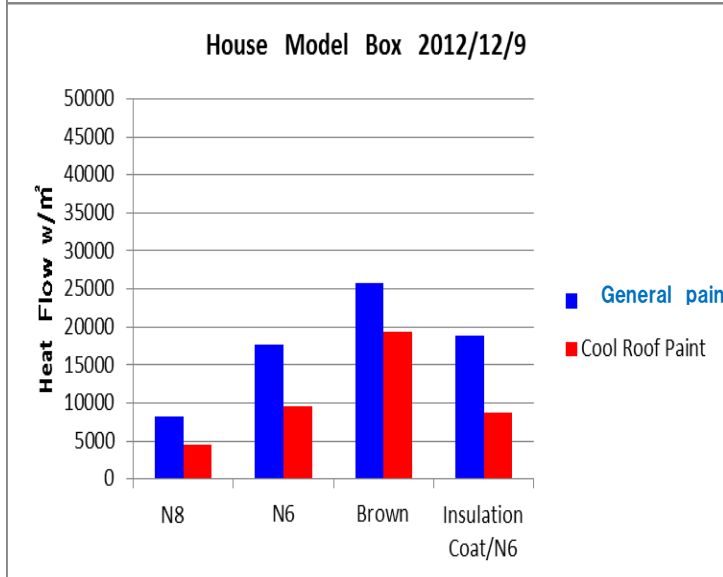
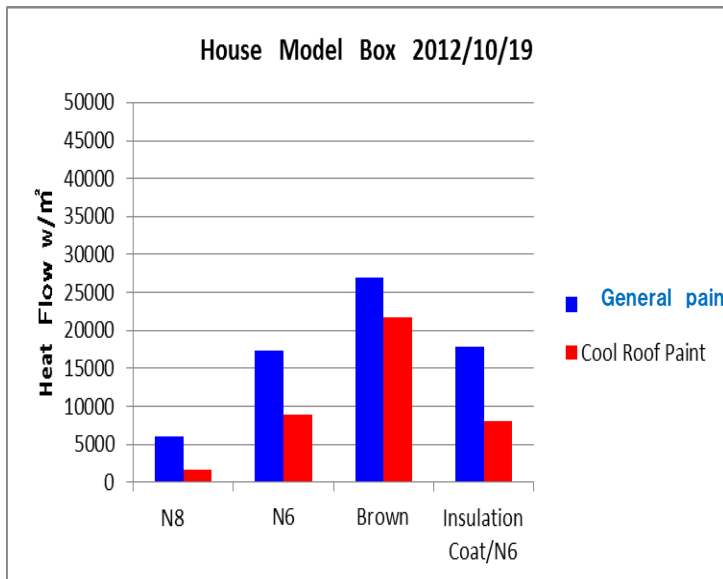
Coating systems

System No.	Type	Brightness (white /Black) and Hue	Additional function	Solar Ref (Total range/ near IR range)	Δ SR (nIR) (Popular-Cool roof)	Luminous Value
1	General paint	N-8 Near White		54.7/ 49	34	80
2	Cool Roof paint	N-8 Near White		70.3 / 83		80
3	General paint	N-6 Gray		26.0 / 22	53	59
4	Cool Roof paint	N-6 Gray		50.9/ 75		59
5	General paint	N-4 Brown		6.9/ 7	49	21
6	Cool Roof paint	N-4 Brown		29.6/ 56		23
7	General paint	N-6 Gray/Primer	Heat- insulating Primer 300 μ	26.0 / 22	53	60
8	Cool Roof paint	N-6 Gray/Primer	Heat- insulating Primer 300 μ	50.6/ 75		59

2012 Technical Cooperation Project in Thailand on High Solar Reflectance Paint as an Effective Energy Saving Technology.



Total heat flow reduction rate for Box type specimen



(1) Oct. 19th

Oct. 19 th	Total heat flow (W/m ²) reduction rate (%)
No. 1 vs. 2	73.2%
No. 3 vs. 4	48.6%
No. 5 vs. 6	19.6%
No. 7 vs. 8	55.1%

(2) Dec. 9th

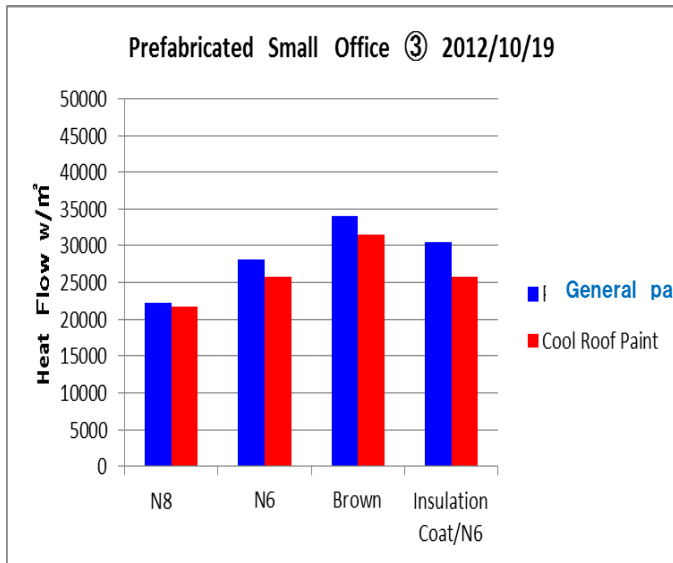
Dec. 9 th	Total heat flow (W/m ²) reduction rate (%)
No. 1 vs. 2	46.2%
No. 3 vs. 4	45.5%
No. 5 vs. 6	25.2%
No. 7 vs. 8	53.9%

Ave. Feb. 8 ~ Mar. 20	
69%	
58%	
27%	
43%	

2012 Technical Cooperation Project in Thailand on High Solar Reflectance Paint as an Effective Energy Saving Technology.

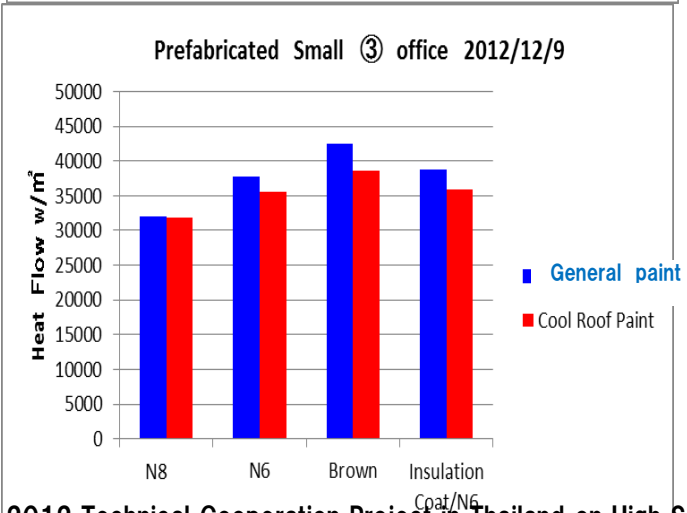


Total heat flow reduction rate for Prefab. House



(1) Oct. 19th
Air conditioning Temp. 23°C

Oct. 19th	Total heat flow (W/m²) reduction rate (%)
No. 1 vs. 2	2.1%
No. 3 vs. 4	8.7%
No. 5 vs. 6	7.4%
No. 7 vs. 8	15.2%



(2) Dec. 9th
Air conditioning Temp. 20°C

Dec. 9th	Total heat flow (W/m²) reduction rate (%)
No. 1 vs. 2	0.7%
No. 3 vs. 4	5.5%
No. 5 vs. 6	8.9%
No. 7 vs. 8	7.4%

Air conditioning Temp. 20°C

Ave. Feb. 8 ~ Mar. 20

7.5%

11%

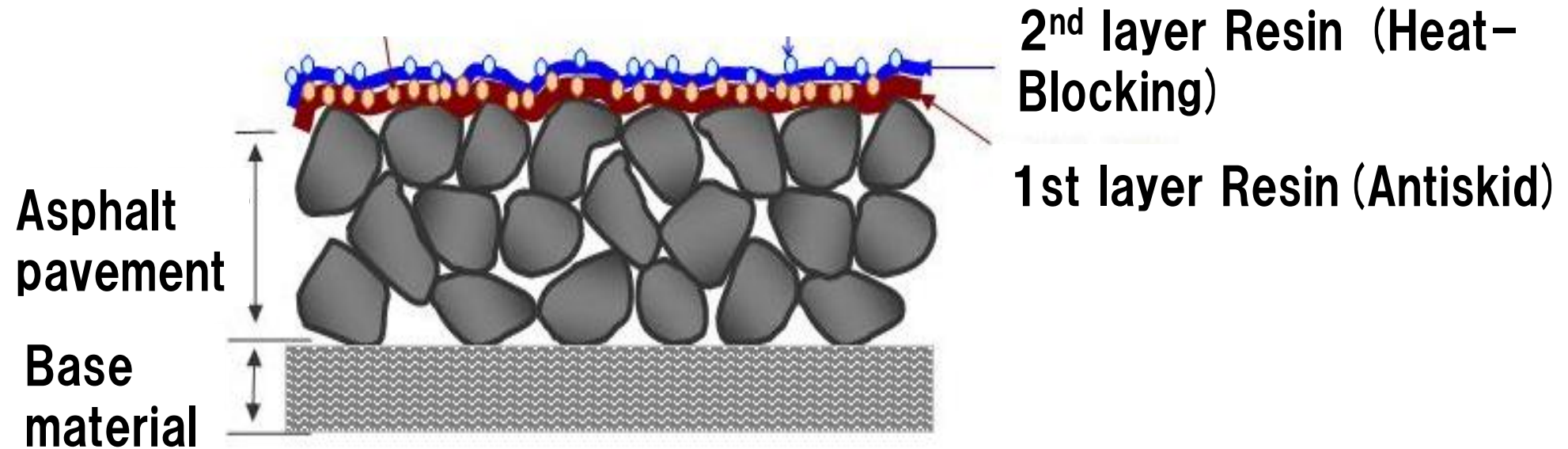
7.5%

-

2012 Technical Cooperation Project in Thailand on High Solar Reflectance Paint as an Effective Energy Saving Technology

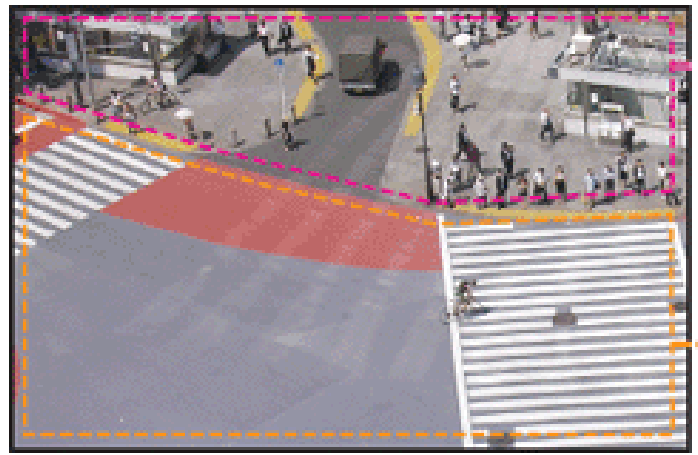
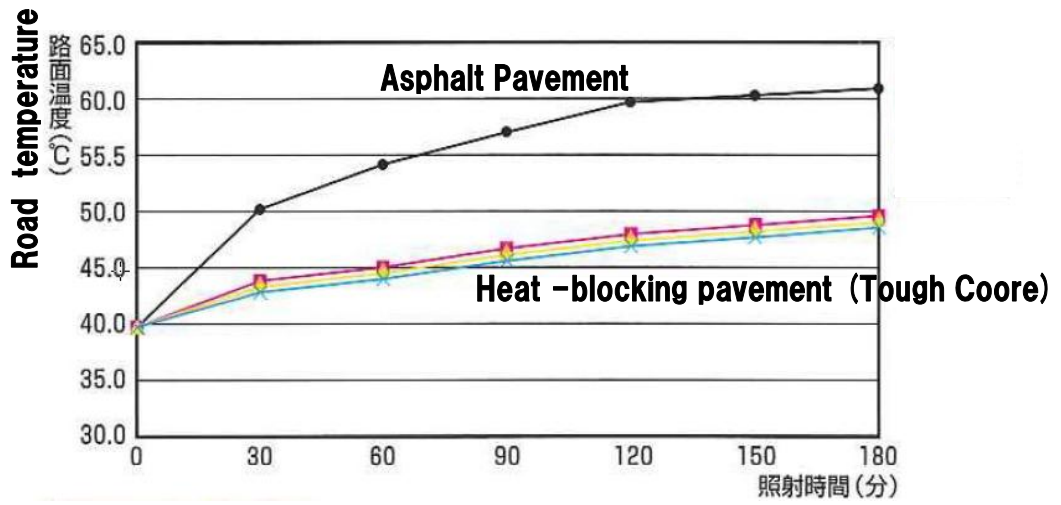
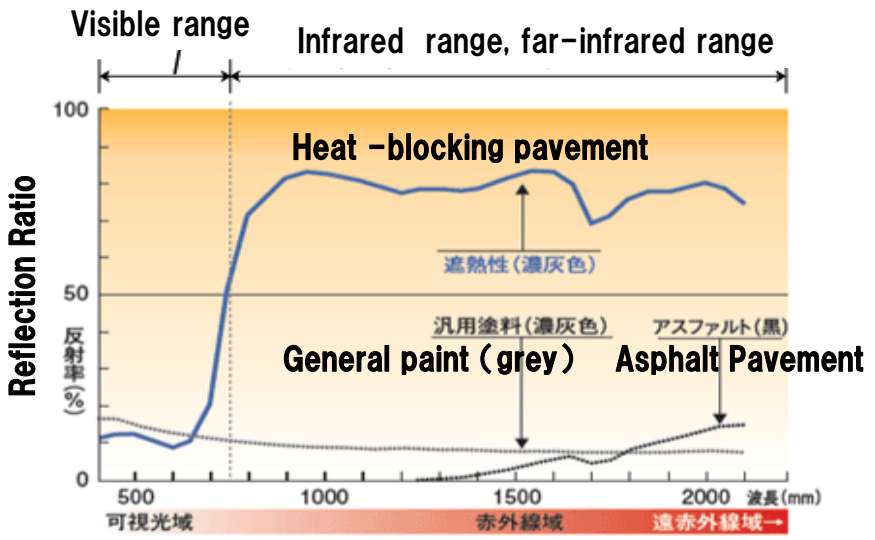


Cool pavements



Ceramics (ZrO_2) are used as heat-blocking materials to enhance durability.

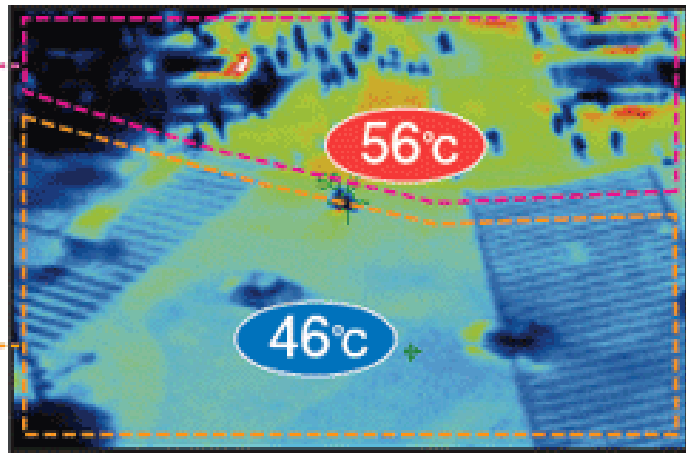
The impacts to the cities



Asphalt Pavement



Heat -blocking pavement

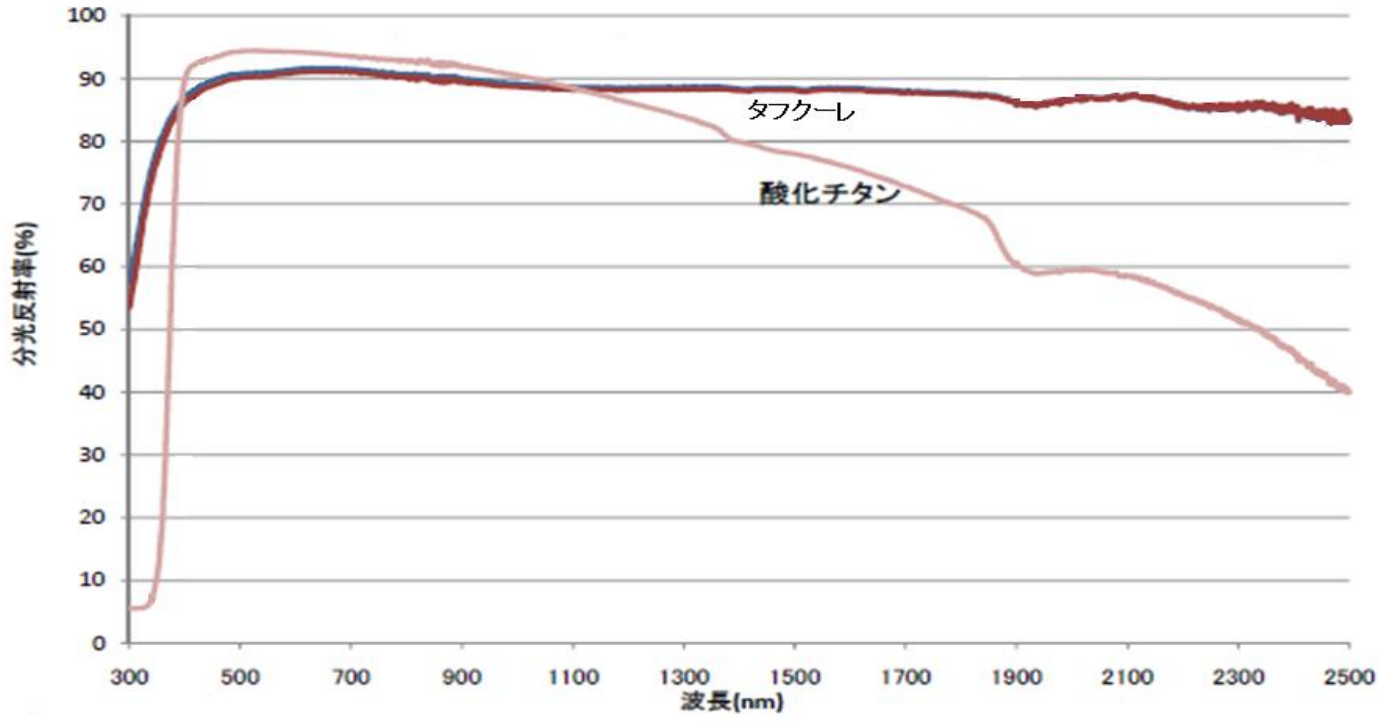


http://www.coolhosouken.com/page03_01.html

Difference of Spectral reflectivity

Measure reflection ratio by press molding from powder

Spectral reflectivity



Tough Coore

Normal Titanium oxide

Wavelength (nm)

Co-benefits

Water permeability



High Durability (Abrasion test)



Summary

- **Buildings are the large invisible consumers.**
- **Infrastructures have long life time.**
- **Almost we have one chance to install energy saving equipments (before completion) .**
- **Energy saving windows, cool roofs and cool pavements have major potential to cool communities.**
- **Technology is ready for use.**

Conclusion

- **Especially in developing countries, energy saving windows, cool roofs and cool pavements have to be installed before construction completion according to population increase and urbanization.**
- **If we have a chance of conversion, we have to utilize the opportunity to change.**

Contact persons

- **Energy saving windows**
masaaki-okabe@agc.com
- **Cool roofs**
takahashi@toryo.or.jp (JIS and General issues)
takasi-takayanagi@agc.com (Products)
- **Cool pavements (Tough Coore)**
hiroyuki-ishikawa@agc.com

References

- <http://www.wbcasd.org/pages/edocument/edocumentdetails.aspx?id=219&nosearchcontextkey=true>
- <http://www.wbcasd.org/Pages/EDocument/EDocumentDetails.aspx?ID=15380&NoSearchContextKey=true>
- <http://www.ecoglass.jp/>
- http://www.agc.com/ir/library/2012/pdf/2012j_complete.pdf
- <http://www.coolhosouken.com/>