New Generation of Fluorinated Water and Oil Repellents

Asahi Glass Co., LTD
AGC Chemicals R&D
Kazunori Sugiyama
We had big earthquake in March 2011
I would like to express my most sincere appreciation for the condolences and assistance Japan has received from approximately 130 countries, more than 30 international organizations, and people all around the world in response to the Tohoku-Pacific Ocean Earthquake.

-Message from Prime Minister Naoto Kan-
FACT in FACT

• Total Sales 1,289 bn. Yen in 2010
• Operating Profit 229 bn. Yen in 2010
• Group Employees 50,400
• 70 bases in 22 countries worldwide
Global Operation

Total Sales: 1,289 bn. Yen
Operating Profit: 229 bn. Yen in 2010

- Japan: 25%
- ASIA: 40%
- Europe: 28%
- The Americas: 7%
AGC PRODUCTS

Total Sales
1,289 bn. Yen
Operating Profit
229 bn. Yen
in 2010

Flat Glass
Automotive
Glass
44%

Chemicals
19%

Display
Glass &
Electronics
Materials
34%

34%
Flat Glass & Automotive Glass

For Construction

For Car
Display & Electronics

Display

Optical Lens

Optical Fiber
Everyone Watches trough our products
Chemicals by AGC

Inorganic Chemicals

One of the raw material for inorganic chemicals
SALT

Fluorine Specialty Chemicals

One of the our product
PTFE
From Raw material to Solution

Fluorine Specialty chemicals by AGC

Fluorite
CaF$_2$
Raw Material

Solution
私たちは化学の力を通じて、安全、安心、快適で、環境に優しい世の中を創造します。
Create a safe, secure, comfortable and environmentally friendly world with chemical technology.
通过我们的化学技术,来创造一个安全、安心、舒适且环保的世界!
Long lasting function makes green

Lumifron (Fluorine paint) can protect steel or concrete. It reduces the total maintenance cost such as repainting or cleaning.
ASAHI GUARD
Fluorinated Water and Oil Repellent by AGC
What is the contribution to Environment in Water and Oil repellent finish?
Textile for Blue Planet?
To join the bluesign
3 Key words

<table>
<thead>
<tr>
<th>Human Friendly product</th>
<th>Ecological Production</th>
<th>With Functional Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.jpg" alt="Human Friendly product" /></td>
<td><img src="image2.jpg" alt="Ecological Production" /></td>
<td><img src="image3.jpg" alt="With Functional Finish" /></td>
</tr>
</tbody>
</table>
Various kind of functional finish

UV-Cut

Anti-micro bacterial

WOR
Most of functional finish are
Modification of fiber.

Function

Is Modification system safe or not at the mill?

Is Finishing agent safe or not for human health?
Fluorinated WOR agent is widely applied.
Various goods

Fluorinated WOR agent is widely applied
Fluorinated WOR agent is Widely applied
PFOA in WOR agent issue

Per Fluoro Octyl Acid
Carbon Number = C8
PFOA

C8

Totally synthetic chemical substance

Highly stable in nature

Bioaccumulative
The reason why PFOA is found in WOR agent at trace amount.

General chemical structure of fluoro WOR agent
The solution is
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990’s</td>
<td>PFOS issue has been focused on. The production of WOR agent contains PFOS has been stopped</td>
</tr>
<tr>
<td>2000</td>
<td>PFOA issue has been focused on.</td>
</tr>
<tr>
<td>2006</td>
<td>AGC became the 1st manufacture of WOR agent based on C6 in the world.</td>
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<tr>
<td>2011</td>
<td>Change from C8 to C6 has been going on. The production of C8 WOR agent by AGC will stop in 2011.</td>
</tr>
<tr>
<td>2012</td>
<td>AGC will tie up the substitution from C8 to C6.</td>
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<tr>
<td>2015</td>
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\[ C_6 \]
• AGC will be the 1st manufacture that tie up the substitution from C8 to C6 chemistry WOR agent.

• It will be complete 3 years earlier than PFOA terminate time line by US-EPA stewardship program.
Is it easy to change from C8 to C6?

Yes, 3 Reasons.
1. Performance of C6 technology has been improved

Water Repellency after 20 times wash on polyamide

- C8 chemistry
- 1st generation of C6 chemistry
- The latest C6 chemistry
2. The treating method of C6 is same as the one of C8.
3. Our global technical support
Is C6 chemistry Safe?
Our WOR agent based on C6 chemistry is high molecular weight polymer.
Deep consideration in C6 chemistry

The anticipated ultimate fluorinated degradation product of residuals is
Perfluorohexanoic acid = PFHxA
Favorable Risk Profile of Our C6 chemistry Pharmacokinetics

<table>
<thead>
<tr>
<th></th>
<th>PFHxDA</th>
<th>PFOA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halflife</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P.K. T 1/2</td>
<td>1 hr</td>
<td>185.6 hrs (1)</td>
</tr>
<tr>
<td>(blood / Rat male)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P.K. T 1/2</td>
<td>5.3 hrs</td>
<td>501.6 hrs (1)</td>
</tr>
<tr>
<td>(blood / Monkey male)</td>
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</table>

(1): Data from draft risk assessment on PFOA, Jan. 2005 by US EPA
PFHxA were NOT detected in carcass, blood and liver.

Favorable Risk Profile of Our C6 chemistry

Carbon Chain Length vs. Bio-concentration Factor

J. W. Martin, S. M. Mabury, 2003
The time to change has come.

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