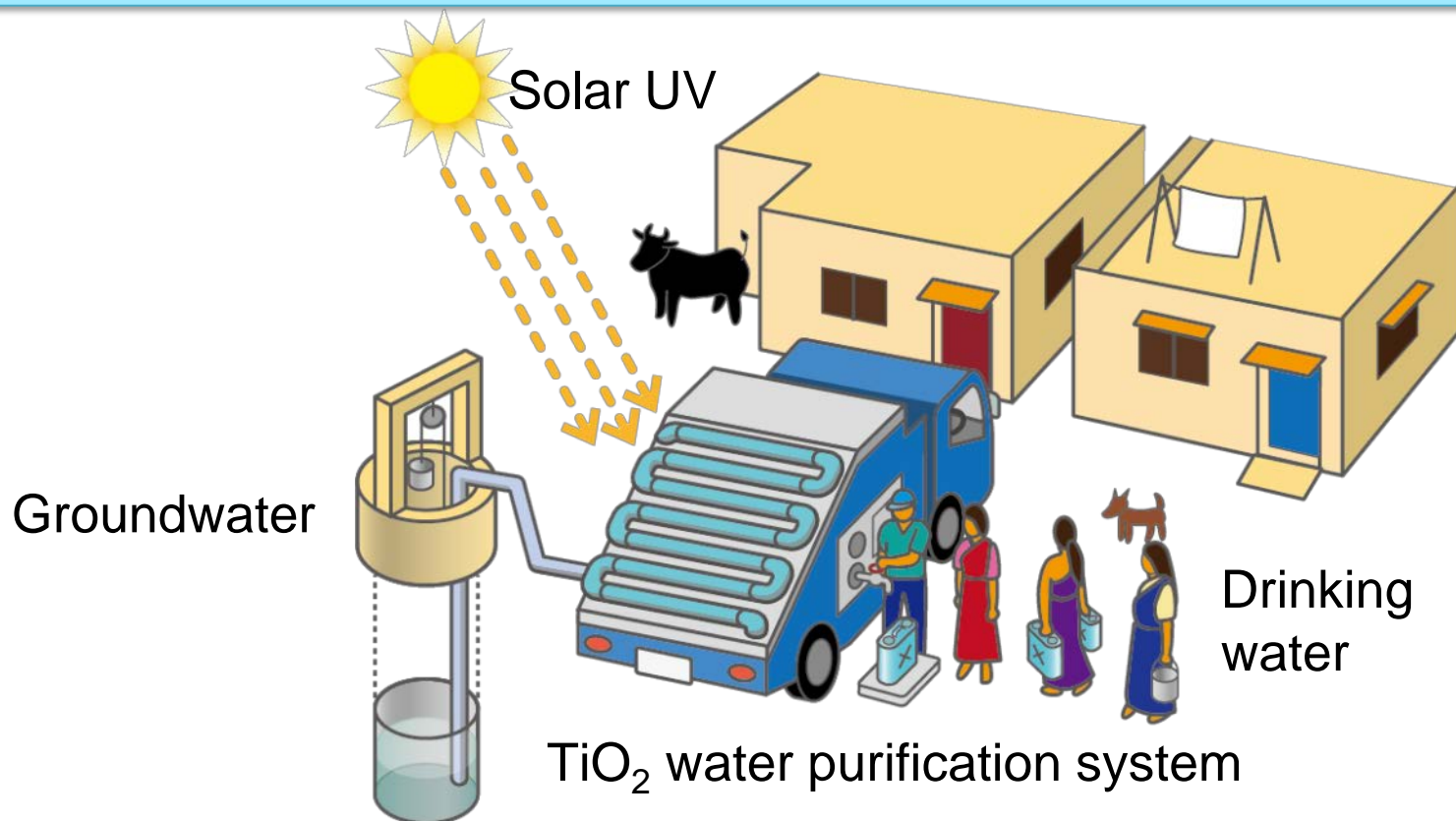


Novel water treatment technology by using TiO_2 photocatalysts

Panasonic Corporation
Hirofumi Fujita and Daisuke Ino



About us

Panasonic Corporation

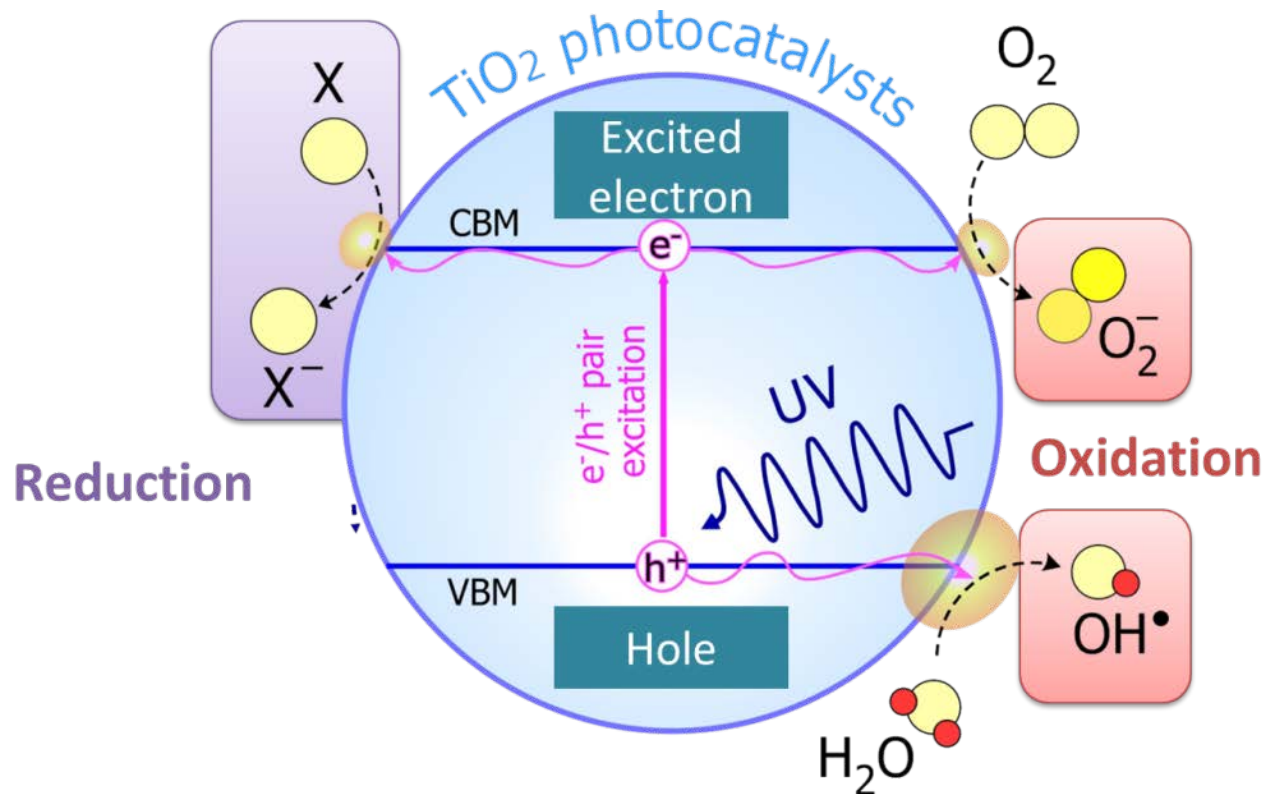


Head Office Location	Kadoma, Osaka, Japan
President	Kazuhiro Tsuga
Foundation	March, 1918
Net Sales	7,715.0 billion yen (=62.9 billion USD)
Number of Employees	254,084

R&D center in Japan and India



Photocatalytic water purification

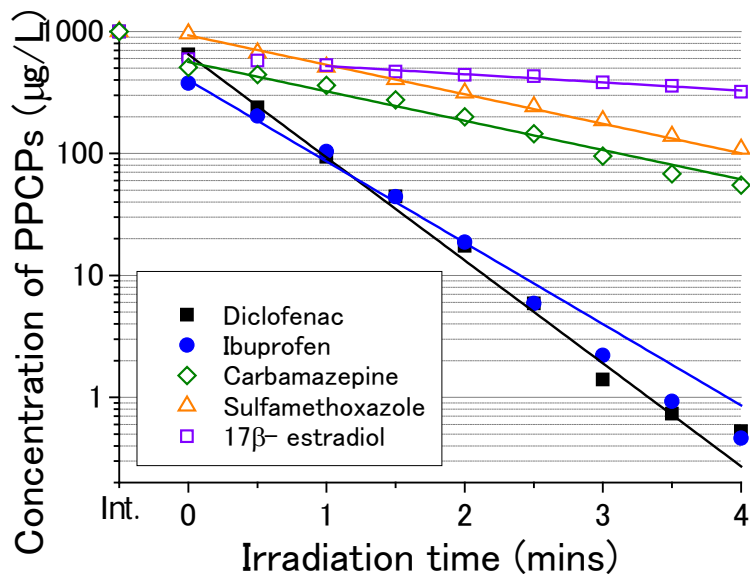


- ✓ Generation of highly reactive radicals
- ✓ Free from residual chemicals
- ✓ less energy consumption

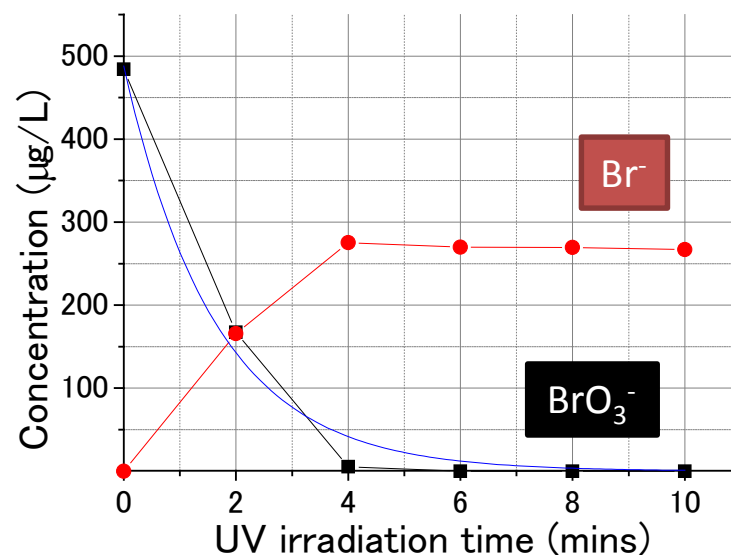
List of pollutants for photocatalytic reaction

Pollutant		Redox	Chemical reaction	Post treatment
Metals	As(III)	Oxidation	$\text{As(III)} \rightarrow \text{As(V)}$	Adsorption
Disinfection byproducts DBP	Bromate	Reduction	$2\text{BrO}_3^- + e^- \rightarrow \text{Br}^- + 3\text{O}_2$	-----
Persistent organic matters	estradiol, diclofenac, atrazine, etc.	Oxidation	Parents molecule \rightarrow fragments	-----
Odor smells	geosmin, 2-MIB, etc.	Oxidation	Parents molecule \rightarrow fragments	-----

Oxidation of pharmaceuticals



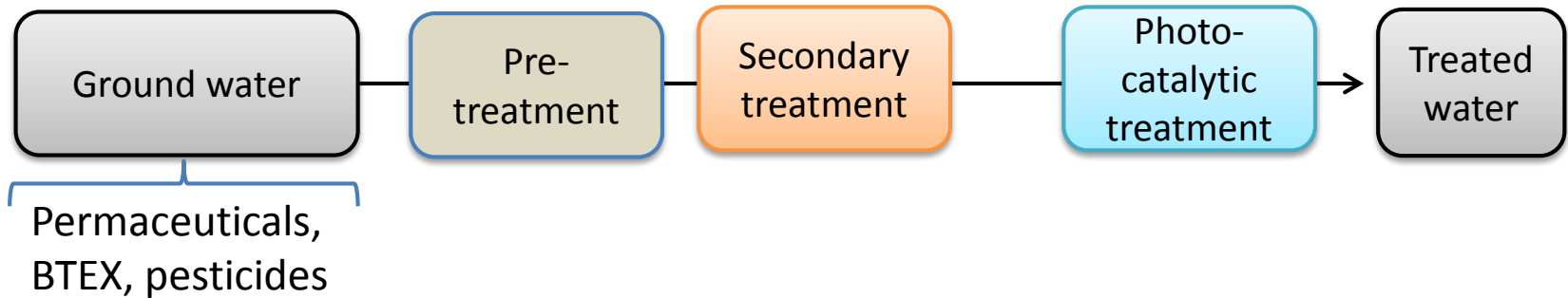
Reduction of bromate



Comparison table

Technology		Ozonation		Photocatalysis	
Methodology		O ₃	O ₃ /UV	Fixed bed	Slurry fluidized
Oxidation species	Main	O ₃ ,	·OH	·OH	
	Sub	·HO ₂ , ·OH	O ₃	·O ₂ ⁻	
Oxi	Unsaturated hydrocarbon	Effective		Effective	
	Saturated hydrocarbon	Non-effective		Effective	
	PPCPs, POM	Non-effective		Effective	
	As(III)	Non-effective		Effective	
Red	Bromate	N/A		Effective	
	Cr(VI)	N/A		Effective	
Reaction Byproducts		BrO ₃ ⁻		None	
Electric energy (kWh/m ³)		0.1	0.2 ~ 1.0	200 ~ 300	0.1 ~ 0.2

Groundwater treatment



Advantages of photocatalytic treatment

1. High reactivity;

Bio-non degradable organic matters such as saturated hydrocarbons, pharmaceuticals and pesticides can be decomposed.

2. Chemical free;

Tri halogenated methane and bromate can not be observed in the treated water.

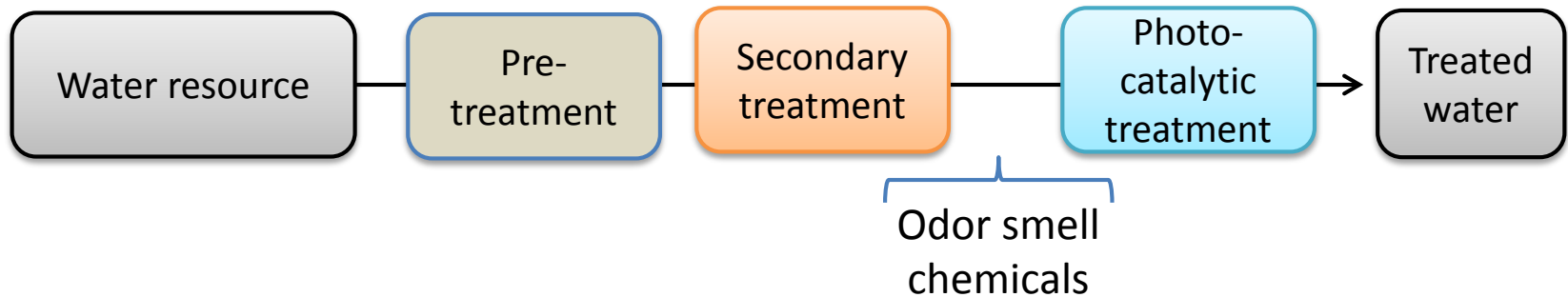
3. Less energy consumption;

Electric energy consumption of this technique reached down to 0.1 kWh/m³.

Requirements for this technology

Removal of turbidity and TDS components prior to this technique might be required for the effective and stable operations.

Hotel tap water treatment



Advantages of photocatalytic treatment

1. High reactivity;

Odor smell chemicals can be completely decomposed.

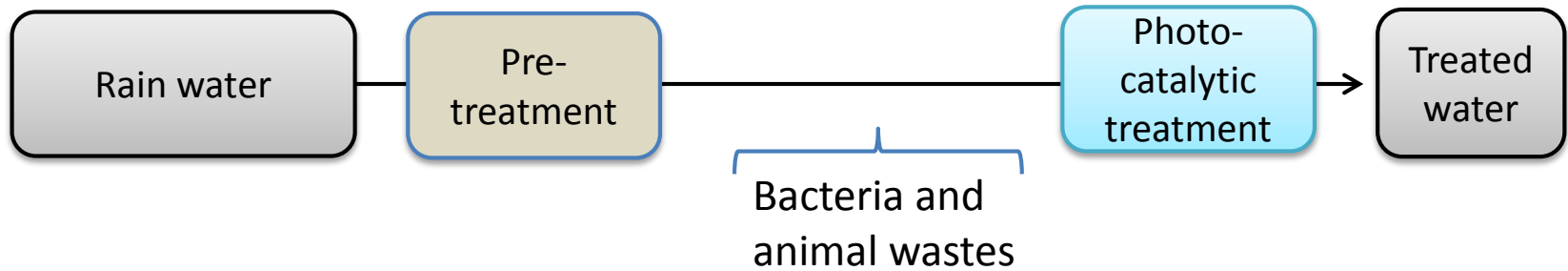
2. Chemical free;

Any residual chemicals can not be observed in the treated water.

Requirements for this technology

None

Rain water treatment



Advantages of photocatalytic treatment

1. High reactivity;

Bacteria and animal wastes can be disinfected and decomposed.

2. Chemical free;

Any residual chemicals can not be observed in the treated water.

Requirements for this technology

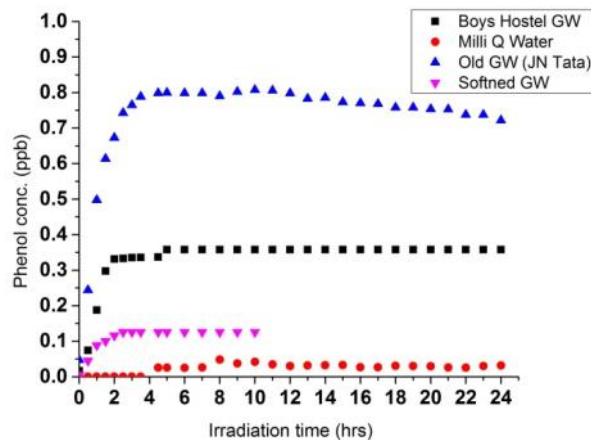
Removal of turbidity prior to this technique might be required for the effective and stable operations

Panasonic Lab. In Bangalore

Testing of Your sample water in our Lab



Photocatalytic prototype apparatus



Example of water treatment data

Lab equipment:

- Photocatalytic prototype apparatus
- Analyzer: HPLC, TOC analyzer, UV/VIS spectroscopy



Panasonic Lab in Indian Institute of Science (Bangalore)