SINCE 1953
JMC

JMC Saccharin

THE SENSIBLE CHOICE FOR YOUR SWEET FUTURE

BEST QUALITY, BEST PARTNER
JMC
SINCE 1953

SALES OFFICE

#70, Yangcheon-ro 73 ga-gil, Gangseo-gu, Seoul, 157-862, South Korea
Tel +82-2-3660-8553 Fax +82-2-752-4791 / jerry@jmcmail.co.kr
www.jmcfinechem.com

HEADQUARTERS/FACTORY

#71, Lijin-Ro, Onsan-Eup, Ulju-Gun, Ulsan, 689-896, South Korea
Tel +82-52-231-5747 Fax +82-70-4170-4710

The World's Best and Global Leader

JMC Saccharin

Since 1953, **JMC** has been recognized as the best quality Saccharin producer in the world. JMC has 60 years of accumulated technological expertise and skilled workforce to become today's global market leader.

JMC Saccharin is the world's highest quality Saccharin available today. Using the traditional Remsen & Fahlberg Process, JMC is the only company that produces all the high purity raw-materials including the OTSA from its own production lines. This in-house up-stream production ensures the highest purity products which lead up to the highest quality Saccharin.

The perfect harmony between tradition and technology: this is **JMC Saccharin**.

Did you know that **Saccharin** has been a part of our daily lives for more than **100** years?

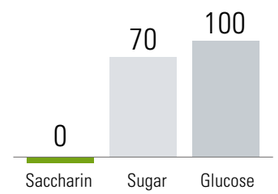
Discovered by I. Remsen and C. Falhberg in 1879, Saccharin as an artificial sweetener and a substitute for sugar, has long been a part of our lives. We use Saccharin in our coffee/tea, in our cereal and eat it in many reduced-calorie or sugar-free foods and beverages every day. **Saccharin** is 350 to 500 times sweeter than sugar, yet has zero calories. In addition, it leaves the body after consumption without being absorbed. Saccharin is very effective against obesity, diabetes, and thus supportive of health. The safety of Saccharin has been a long controversy, but years of numerous tests and experiments have proven irrefutably that such prejudice has been wrongfully unfounded. Authorities such as WHO, NTP and the FDA have also repeatedly confirmed its safety. Saccharin with over a century of use, has long been prepared for a 'Sweet Future' in which it will only grow in popularity.

Saccharin is **Healthy**

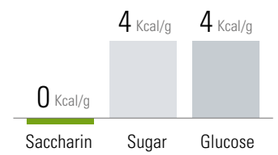
Due to the fact that Saccharin, unlike sugar, has no effect on blood sugar levels and has zero calories, it is considered as the solution for the sugar substitute for diabetes and obesity. Furthermore, while it is well-known that sugar produces cavities, Saccharin does not produce any of the acid that results in cavities.

Such is the healthy surprise of Saccharin which aids diet, diabetes control, and cavity prevention without giving up the happiness derived from its sweetness.

Diabetic patients can safely consume Saccharin because its Glycemic Index (GI) is **zero.**



Obesity is not a concern because it also has **zero** calories.



Saccharin is **Excellent**

Saccharin is 350 to 500 times sweeter than sugar and costs only 1/40 the price of sugar and 1/8 the price of aspartame for the same level of sweetness. It can be called 'The Dream Sweetener' in terms of sweetness and economical feasibility as well as health. The sweetness equivalency costs are below.

$1.00/kg Saccharin will provide as much sweetness as:

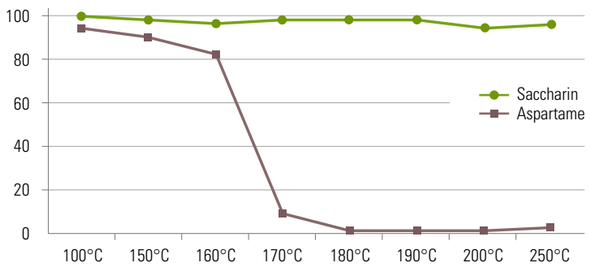
Saccharin	Sugar	Aspartame	Acesulfame-K	Sucralose	Stevia
$1/kg	$40/kg	$8.3/kg	$11.6/kg	$11/kg	$4.4/kg

Based on the Korean domestic market prices in 2013

Saccharin's strength is not only limited to its economical value. It can also be preserved for a long period of time without decomposition and can also act as an effective stabilizer. Moreover, this 'Dream Sweetener' is thermal resistant. In an experiment, Saccharin and aspartame were heated for 30 minutes.

In the final results, Saccharin did not show any change in its composition, regardless of temperature. On the other hand, aspartame started to decompose at 150°C, became 91% decomposed at 170°C, and decomposed completely after 180°C. The final results appear that aspartame is not appropriate as a sweetener for high temperature usage in food such as baked goods.

Thermal Resistance Comparison Between Saccharin and Aspartame



Source: JMC's R&D Center

Decomposition Rate According to Temperature

Temperature	100°C	150°C	160°C	170°C	180°C	190°C	200°C	250°C
Saccharin	99%	98%	97%	98%	98%	98%	95%	96%
Aspartame	95%	91%	82%	**9%**	**1%**	**1%**	**1%**	**2%**

Source: JMC's R&D Center

Saccharin is **Safe**

Saccharin is the oldest artificial sweetener in market today since its finding in 1879, but faced prejudice and infamy as a harmful material after the carcinogen controversy in 1977 in North America. However, 30 years of studies and experiments by many scientists have proved its safety for human consumption. Additionally, WHO and other international authorities have been recognizing as well as endorsing Saccharin's safety for many years.

Saccharin is currently being used in around 100 countries as a food additive without any adverse effects.

Saccharine Makes A Comeback

1993 — World Health Organization (WHO)
Confirmed as a safe artificial sweetener for human consumption

1998 — International Agency for Research on Cancer (IARC)
Deleted from list of carcinogens

2000 — National Toxicology Program (NTP)
Deleted from list of carcinogens

2001 — Food and Drug Administration (FDA)
Declared safe for human consumption

2010 — Environmental Protection Agency (EPA)
Deleted from list of toxic materials

2011 — The Wall Street Journal (WSJ)
US President **Barack Obama** commented that the EPA's decision to eliminate the regulation on Saccharin was wise

THE WALL STREET JOURNAL

Join the global consensus on premium grade Saccharin

JMC Saccharin

There are several Saccharin producers in the world, yet there is no other company besides JMC that boasts the longest history as well as the highest quality Saccharin production.

JMC has over 60 years of production experience and know-how, and has differentiated most proper method for Saccharin production. JMC produces its own key raw materials for high purity Saccharin, and uses potable water instead of organic solvents. Accordingly, JMC supplies the best quality Saccharin to well-known international food companies as well as world-wide pharmaceutical companies. **JMC Saccharin**, the brand with the longest history and the best quality, works hard on benefiting its partners' interests and convenience.

JMC is naturally the right choice for your company's sweet future.

1953

JMC Saccharin's Birth

60 *years*

The Longevity of **JMC**'s Efforts for the Best Saccharin

No.1

The Level of The Quality **JMC** Has Accomplished.

JMC's R&F Process

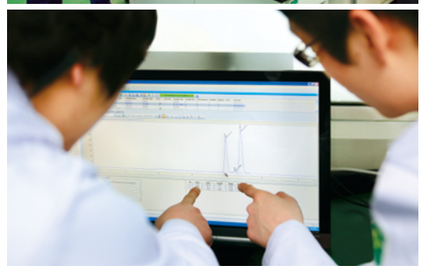
The optimal method for creating high quality Saccharin

JMC's premium quality starts with its choice of utilizing the Remsen & Fahlberg (R&F) Manufacturing Process. The R&F Process was originally developed by Dr. Remsen & Dr. Fahlberg when they discovered Saccharin at Johns Hopkins University in 1879. It is the foundation of JMC Saccharin's competitive advantage.

The R&F Process is differentiated from other processes in which numerous irremovable impurities are produced. The R&F Process is the optimal method for creating high quality Saccharin since it does not produce other impurities than the OTSA residue, which can also be eliminated by repeated purifications with potable water. Securing the quality raw material is difficult because it needs special technical handlings with particular facilities. That is the reason that any new entrant is not easily allowed.

Therefore, the R&F Process is available only for producers like JMC that is completely prepared with accumulated technologies, expertise, and experience. JMC has the longest experience with the R&F Process among all current producers, while continuing to renovate it.

The exclusive status of **JMC Saccharin** proves the excellence of JMC's R&F Process not only in all grocer applications but also in high-end food, beverage, personal care, and pharmaceutical industries.



JMC's Self-Produced OTSA

JMC's high quality Saccharin comes from the high purity raw materials.

JMC's R&F Process requires the OTSA (Ortho-Toluenesulfonamide) as a raw material, while other processes use a different raw material, PA (Phthalic Anhydride) and it contains numerous impurities during the chemical reactions. On the other hand, the R&F Process is the optimal method for high quality Saccharin since it does not produce any by-product. However, the OTSA, the key raw material of Saccharin, is not abundantly available in the world market. Few companies manufacture the OTSA because its isomers require special handling.

JMC self-produces 99% plus purity the OTSA by JMC's own quality regulations. JMC can stabilize its production without having problems in securing raw materials. Therefore, there is no outside factor to influence the production. Moreover, JMC monitors and controls every step of quality in its entire process for the best products that are required by the global customers.

Global Standards

JMC Saccharin complies with all Pharmacopoeias & Food standards.

JMC Saccharin conforms to all Pharmacopoeias & Food standards (USP/NF, FCC, JECFA, EP, E954, JP, KP etc.). Currently all the global standards are identifying and ruling the quality of Saccharin based on JMC's production process. Why is that? It is because JMC's production process is a widely proven process for high quality Saccharin. Also, JMC Saccharin is safe from CMR (carcinogenic, mutagenic or reprotoxic) and genotoxicity. Moreover, JMC Saccharin is free from any allergen, irradiation, pesticides, GMO, BSE/TSE, gluten, latex and lactose, although these are not regulated in Pharmacopoeias. On the other hand, other Saccharin produced using PA, contains impurities that are not measured by the current Pharmacopoeias. There are ever-increasing concerns about the risks of the impurities in Saccharin produced by other processes than the R&F. This problem is not supposed to be overlooked for our future generations.

No Organic Solvents

JMC Saccharin is refined with potable water.

The high purity OTSA is used in JMC's R&F Process, and there remain no other organic impurities except the residual OTSA which can be refined by only portable water. **JMC Saccharin** is fundamentally free from toxic materials due to the impurity-free process and raw materials, and purification process without organic solvents. It is city water that JMC uses for purification and crystallization. City water is regularly tested for physicochemical and microbiological examinations by the local government. In addition, JMC thoroughly manages the quality of the water by its own strict standards.

Multiple organic impurities produced from another process using PA can only be refined by other chemicals like organic solvents. It is not physicochemically possible to completely remove these different impurities with a specific organic solvent.

Therefore, there remain various impurities unrefined and organic solvents also stay in Saccharin. Namely, organic solvents together with unrefined impurities become final impurities in other Saccharin.

No Impurities

There is no room for impurities in JMC Saccharin.

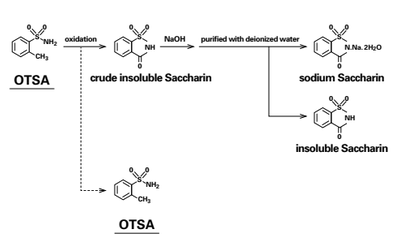
Since **JMC** uses the OTSA - the high purity raw material, based on the R&F Process - the optimal method for high quality Saccharin, there is no room for impurities in JMC Saccharin. While other Saccharin producers use different raw materials such as PA, which contains various impurities such as methyl anthranilic acid reacted with NH3, NaOH, Br2 and methyl anthranilic acid reacted with MeOH. There are many other impurities such as 1,2-benzothiazoline-3-one, p-Sulphonamidebenzoic acid and many other unknown impurities that cannot be easily removed because their structures are similar to Saccharin. So, it is highly possible that these impurities still remain in Saccharin even after refinement processes.

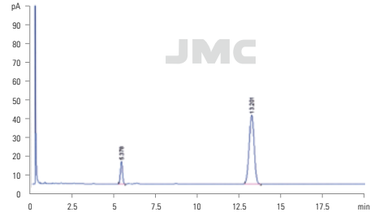
However, JMC produces Crude Insoluble Saccharin through oxidation without going through other steps, and refines it. This is why there are no unintended impurities in JMC Saccharin.

Comparison of Manufacturing Processes & Impurities

JMC's R&F Process: from the OTSA

JMC Saccharin is made from the OTSA, and there are no impurities except the raw material, the OTSA. And, the residual OTSA is filtered through purification processes.



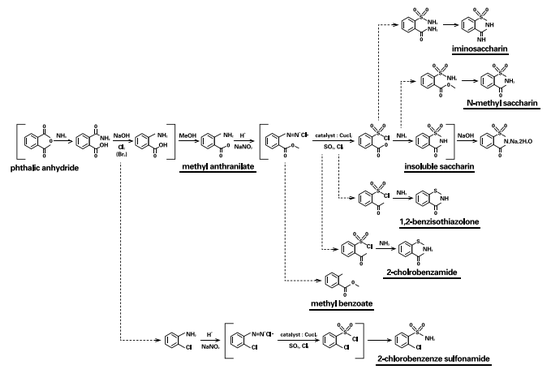


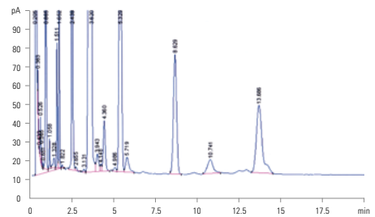
Source: JMC's R&D Center

Another Process (Maumee Process): from Phthalic Anhydride

Saccharin produced by PA contains various impurities such as 1,2-benzothiazoline-3-one(BIT), Methyl anthranilate, Benzamide, Methyl benzoate,2-Chlorobenzamide, etc.

These impurities remain unrefined in Saccharin.





Source: JMC's R&D Center

JMC'S HISTORY

The best Saccharin has been accomplished through JMC's History.

1953 Jeil Moolsan Company (JMC) was founded

1954 Established Saccharin Plant for the first time in Korea

1981 Moved to the new plant at the current Onsan Industrial Complex for extension of production capacity

1997 Acquired ISO9001 from BV (UK)

2004 Incorporated into Kyung-In Synthetic Corporation Group

2005 Acquired ISO14001 and OHSAS18001 system from BV (UK)

2012 Acquired FSSC22000 from SGS

JMC TECHNOLOGY

JMC has been developing new technologies in Organic Synthesis.

1. Chlorosulfonation / Sulfonation: ArH→ArSO2Cl, ArSO3H
2. Hologenation: R-OH→R-Cl(X=halogen), Ar-H→Ar-X(X=halogen)
3. Cyanation: Ar-X→Ar-CN, RCOX→RCOCN
4. Esterification: R-OH+R′COX→ROCOR′
5. Nitration and Reduction: Ar→Ar-NO2→ArNH2
6. Oximeformation: RCOCH2R′→RCOCR′=N-OH
7. Benzoin Condensation: 2ArCHO→Ar-CH(OH)-CO-Ar
8. Friedel Craft Acylation: ArH+Ar′COX→ArCOAr′
9. Friedel Craft Alkylation: ArH+RX→ArR
10. Oxidation
11. Phthalocyanine ring formation
12. Metal complexation
13. Phopyrazine ring fromation.
14. Suzuki coupling: ArB(OH)2+Ar′X→Ar-Ar′
15. Grignard coupling: Ar-MgBr+R-X(or CO)→Ar-R(or Ar-CH(OH)R)
16. Buchwald-hartwigRxn: Ar-NH2+Ar′-X→Ar-NH-Ar′
17. Kumadarxn: Ar-X+Ar′-MgBr→Ar-Ar′
18. Chloromethylation: ArH→ArCH2Cl
19. Radical Polymerization
20. Polyester binder Polymerization.
21. Acrylic monomer synthesis

JMC Saccharin has gained official approvals for Quality, Safety, and Environmental Control from international authorities.

ISO 9001
Quality Management System

ISO 14001
Quality Management System

OHSAS 18001
Health & Safety Management System

FSSC 22000
Food Safety System Certification

Kosher
Certification