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**Johnson Matthey Process Technologies and Rennovia Announce On Time Start-up  
of Mini-Plant for Bio-Based Glucaric Acid Production Using Jointly Developed Technology**

*Major milestone accomplished in commercialization of breakthrough process technology*

London, England & Santa Clara, CA – July 16, 2015 – Johnson Matthey Process Technologies, a global provider of advanced process technologies, and Rennovia Inc., a privately held company that develops novel catalysts and processes for the cost advantaged production of chemical products from renewable feedstocks, announced today that they have successfully started-up a mini-plant for production of glucaric acid from glucose using jointly developed technology.

In March 2014, Johnson Matthey and Rennovia announced their collaboration to develop and commercialize production technology for bio-based glucaric acid and adipic acid. Adipic acid, an industrial chemical conventionally derived from petroleum, is a multi-billion dollar global market, with major applications in nylon fibers and engineering polymers, polyester polyols for polyurethanes, and adipate esters for phthalate-free plasticizers. Glucaric acid, an intermediate in the production of adipic acid, is an emerging platform chemical with a wide range of applications in detergents and cleaners, concrete formulations, de-icing and anti-corrosion markets.

“The construction of a fully integrated mini-plant to produce bio-based glucaric and adipic acids using Rennovia / Johnson Matthey technology is a critical enabler for our collaboration with Rennovia. We are delighted to confirm the successful, on time start-up of the 1<sup>st</sup> phase of the mini-plant based on the jointly developed technology for the catalytic aerobic oxidation of glucose to glucaric acid. The mini-plant is located at the Johnson Matthey Process Technologies R&D Center in Stockton, England” said David Prest, Managing Director Johnson Matthey Process Technologies Chemicals Business.

“In addition we continue, as planned, with the design & construction of the 2<sup>nd</sup> phase of the facility based on jointly developed technology for the catalytic hydrogenation of glucaric acid to adipic acid. The learnings from this mini-plant will provide the design basis for commercial scale manufacturing facilities and will enable us to provide licensees with process guarantees” added Prest.

“The successful operation of this mini-plant is a major milestone in the scale-up and commercialization of the 1<sup>st</sup> products using Rennovia / Johnson Matthey technology and demonstrates the strategic importance of our partnership with Johnson Matthey Process Technologies” said Robert Wedinger, President and CEO of Rennovia. “We look forward to continuing to work closely together as they expand the mini-plant’s capability to include production of adipic acid. We continue to see this as an excellent way to accelerate the commercialization of our innovative process technology for the production of cost advantaged glucaric and adipic acids”.



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**About Johnson Matthey Process Technologies:**

Johnson Matthey Process Technologies is one of five divisions within Johnson Matthey group, and a key part of the company's strategy for future growth. The division is a global supplier of catalysts, licensed technologies and other services to the petrochemical, syngas, oil refining and gas processing industries. The division serves customers around the world and has manufacturing sites in the UK, USA, Sweden, Germany, India and China, supported by technology development facilities in the UK and US and technical offices in all of the key markets worldwide.

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**About Rennovia:**

Rennovia is a chemical process technology development company focused on the creation of novel processes for the cost advantaged production of commodity and specialty chemicals from renewable feedstocks. For further information, visit [www.rennovia.com](http://www.rennovia.com) or e-mail [info@rennovia.com](mailto:info@rennovia.com).

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### **Rennovia and Johnson Matthey to Co-Develop Commercial Catalysts for Biobased Adipic Acid Process**

London, England and Santa Clara, California (February 27th, 2015) – Rennovia Inc., a specialty chemical company focused on the creation of novel processes for the cost advantaged production of chemicals from renewable feedstocks, and Johnson Matthey, a global specialty chemicals company, announced today that they have entered into a joint development agreement for the co-development and manufacture of catalysts to be used in the scale-up and commercialization of Rennovia's process for the production of bio-based glucaric acid and adipic acid.

This agreement, for the co-development and manufacture of catalysts, builds upon the existing collaboration, announced in March 2014, under which Rennovia and Johnson Matthey Davy Technologies are working together on the engineering and construction of a mini-plant to optimize and scale the process, which will enable commercial production of these products. The focus of the joint development effort announced today will be to develop and supply catalysts for the mini-plant and future commercial plants.

“Our agreement with Johnson Matthey is another major milestone in Rennovia's goal to commercialize the production of its bio-based glucaric acid and adipic acid products,” said Robert Wedinger, President and Chief Executive Officer of Rennovia. “We are excited to be working with the Johnson Matthey group on both the mini-plant and the catalyst supply for this program.”

“Johnson Matthey is delighted to be co-developing catalysts with Rennovia for its adipic acid process,” said Geoff Otterman, Division Director of Johnson Matthey's Process Technologies Division. “This is a further opportunity for Johnson Matthey to demonstrate its expertise in sustainable technologies through the co-development, scale-up and manufacturing of custom designed catalysts for new biobased chemical processes”.

#### Johnson Matthey

Johnson Matthey is a global specialty chemicals company underpinned by science, technology and its people. A leader in sustainable technologies, many of the group's products enhance the quality of life of millions through their beneficial impact on the environment, human health and wellbeing. In catalysis, it is a supplier of both precious and base metal catalysts and offers products for a diverse range of industries: from fuel cells and environmental catalysts to petrochemicals, edible oils and specialist oil and gas purification. For further information on Johnson Matthey, visit [www.matthey.com](http://www.matthey.com); for further information on process catalysts, visit [www.jmprotech.com](http://www.jmprotech.com).

#### Rennovia

Founded in 2009, Rennovia Inc. is a specialty chemical company focused on the creation of novel processes for the cost advantaged production of chemicals from renewable feedstocks. Rennovia is



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developing processes for the production of biobased glucaric acid, adipic acid, 1,6-hexanediol (1,6 HDO), hexamethylenediamine (HMD), and other important building blocks for a wide range of functional materials. For further information, visit [www.rennovia.com](http://www.rennovia.com).



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**Johnson Matthey Davy Technologies Ltd. and Rennovia, Inc. to develop and commercialize production technology for bio-based glucaric acid and adipic acid**

Johnson Matthey Davy Technologies Ltd. (JM Davy), a global provider of advanced process technologies and Rennovia, Inc., a development stage company focused on the production of commodity and speciality chemicals from renewable feedstocks, announced today that they are embarking on a collaboration to develop, demonstrate and commercialize catalytic process technologies for the production of bio-based glucaric acid and adipic acid.

Under the collaboration, Rennovia and JM Davy will work together to develop and demonstrate the processes based on Rennovia's technology for the catalytic aerobic oxidation of glucose to glucaric acid, as well as the catalytic hydrogenation of glucaric acid to adipic acid. The goal of the collaboration is to develop and jointly license a technology package enabling commercial production of these chemical products.

Adipic acid, an industrial chemical conventionally derived from petroleum, is a multi-billion dollar global market, with major applications in nylon-6,6 fibers, engineering resins, polyester polyols for polyurethanes, and adipate ester plasticizers. JM Davy and Rennovia anticipate delivering technology capable of producing a bio-based adipic acid equivalent to the petroleum-based product, at a lower cost, and with a significantly improved environmental footprint.

Glucaric acid is an emerging platform chemical with wide applications in detergent, de-icing, cement, and anti-corrosion markets.

"JM Davy is excited at the prospect of co-developing and licensing the process to produce glucaric and adipic acid with Rennovia and promoting the technology throughout the world", said Antoine Bordet, Managing Director of JM Davy. "JM Davy sees this as an opportunity to extend its bio-based process technology portfolio which has already licensed 1.5 million tonnes of bio-based chemical product utilizing catalytic chemical transformations".

"With their extensive experience developing and licensing catalytic process technologies across a wide range of bio-based and petrochemical markets, Rennovia considers JM Davy an ideal development and licensing partner for our renewable glucaric acid and adipic acid products," said Robert Wedinger, President and CEO of Rennovia. "We look forward to working with JM Davy to deliver technologies to the marketplace that are scalable, less capital-intensive, and cost-advantaged over current petrochemical processes."



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#### About JM Davy

Johnson Matthey Davy Technologies Ltd. is a global business developing and licensing proprietary technology for the chemical process industries and transferring the know-how, through provision of basic engineering packages and related technical services including commissioning support. JM Davy has its headquarters in London, England, a technology centre in Teesside in the North of England and a client support office in Beijing, China. JM Davy utilises a range of reaction technologies including, hydrogenation, oxidation, esterification, hydroformylation, reforming, synthesis etc. on which its proprietary processes are based.

#### About Rennovia

Founded in 2009, Rennovia, Inc. is a chemical process technology development company focused on the creation of novel processes for the cost-advantaged production of commodity and speciality chemicals from renewable feedstocks. In addition to adipic acid and glucaric acid, Rennovia also is developing a bio-based hexamethylenediamine (HMD), an important building block for a wide range of functional materials, including nylons and polyurethanes. For further information, visit [www.rennovia.com](http://www.rennovia.com).