UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

E. I. DU PONT DE NEMOURS AND COMPANY and
ARCHER-DANIELS-MIDLAND COMPANY,
Petitioners,

v.

FURANIX TECHNOLOGIES B.V.,
Patent Owner

Case IPR2015-01838
Patent 8,865,921

DECLARATION OF GERT-JAN GRUTER, Ph.D.

Exhibit 2007

I, Dr. Gert-Jan Gruter, hereby declare and state the following:

1. I am the Chief Technology Officer for Avantium, in the Netherlands, of which Furanix Technologies, B.V. is a wholly owned subsidiary.

2. I graduated from Rijksscholengemeenschap Breda in the year 1983. After two years of military service (United Nations Interim Force in Lebanon), I received a MSc degree of Organic Chemistry in 1990 from the Vrije Universiteit Amsterdam. Subsequently, I obtained my Ph.D. in the field of Organometallic Chemistry in 1994 from the same University. From 1994 to 2000, I was leading a polyolefin (Polyethylene, Polypropylene and EPDM rubber) catalyst development R&D team at DSM Research in Geleen, the Netherlands (currently Sabic R&D).

3. I have worked at Avantium since the start of the company in 2000. I started as Avantium's VP Technology Chemicals, in which role I was responsible for developing Avantium's unique parallel reactor catalyst testing platform. I was also responsible for Avantium's contract research activities in the field of chemical catalysis. In that role, I was responsible for signing two multi-million multi-year programs with large chemical companies in the area of aromatic side-chain oxidation (1) with DSM on toluene oxidation (http://www.chemeurope.com/en/news/7947/dsm-and-avantium-announce-

research-collaboration-in-high-throughput-experimentation-for-life-science-products.html) and (2) with BP on para-xylene oxidation (https://www.avantium.com/press-releases/avantium-bp-extend-strategic-partnership/) For these two large programs, we developed oxidation catalyst testing equipment with 96 parallel stirred autoclaves in which we conducted more than 50,000 experiments in the area of aromatic side-chain oxidation.

4. In 2004, I was appointed as Chief Technology Officer (CTO). One of my main responsibilities was to initiate and lead Avantium's own product and process development. In 2004-2005, I initiated Avantium's research program to convert carbohydrates into furans such as 5-hydroxymethyl furfural (HMF) and 5-methoxymethylfurfural (MMF), and subsequent oxidation to 2,5-furan dicarboxylic acid (FDCA), which Avantium is currently commercializing. From 2004 to today, I have been intimately involved in oxidation research at the Avantium labs in Amsterdam. I have 15 years of experience in researching, developing and conducting oxidation reactions involving aromatic compounds.

5. I am a named inventor on numerous patents and applications, including U.S. Patent No. 8,865,921 ("the '921 patent," Exhibit 1001 or Ex. 1001) that is the subject of this IPR proceeding. A copy of my *curriculum vitae* is included with this declaration as Exhibit 2008 ("Ex. 2008, c.v. of Dr. Gruter). I understand that this declaration itself has been designated for this IPR as Exhibit 2007

("Ex. 2007," Declaration of Dr. Gert-Jan Gruter).

6. I am not being compensated for preparing this declaration in any respect beyond my regular salary associated with my employment at Avantium.

7. In 2008-2009, I was leading the research team at Avantium. In that role, I was intimately involved in the design and execution of the oxidation reaction experiments shown in Examples 1, 2 and 3 and Tables 1, 2 and 3 of the '921 patent for producing 2,5-furandicarboxylic acid ("FDCA"), as described in more detail below in this declaration. These procedures and results of these 2008-2009 experiments are presented in Examples 1, 2 and 3 and Tables 1, 2 and 3 of the '921 patent. *See* the '921 patent (Ex. 1001) 6:7 to 7:59.[1]

8. In 2016, I designed and participated in additional oxidation experiments for producing FDCA, as described in more detail below in this declaration. These 2016 experiments were done for this IPR and were done in accordance with the procedures set forth in Example 1 and Table 1 of the '921 patent. The 2016 experiments show the oxidation of 5-hydroxymethyl-furfural ("HMF") alone, as well as oxidation of mixtures of HMF and an ester of HMF(5-acetoxymethyl-furfural or "AMF") to produce FDCA, at temperatures of 145 ºC, 160 ºC, 180 ºC and 195 ºC.

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[1] With regard to any references cited, in the notation X:Y, "X" is the column number and "Y" is the line. If there are no columns, the "X" is the page number.

9. The 2008-2009 and 2016 oxidation experiments show unexpectedly improved yields for the FDCA end product, as compared to processes for making FDCA in the prior art to the '921 patent, using a similar homogeneous catalyst system. This is particularly true relative to the process in WO/0172732A2 ("the '732 publication," Ex. 1002), which I understand the Petitioners in this IPR have asserted is the closest prior art to the claims of the '921 patent at issue.

FDCA History and Background

10. As described in the background of the '921 patent, the organic compound FDCA was first obtained in 1876. *See* the '921 patent (Ex. 1001), 1:30-32. Over 125 years later, the US Department of Energy identified FDCA as one of 12 priority chemicals for establishing the "green" chemistry industry of the future. *See* the '921 patent (Ex. 1001), 1:34-35, referring to Top Value Added Chemicals from Biomass, U.S. Dept. of Energy (August 2004) (Ex. 2005), also cited at (http://www.nrel.gov/docs/fy04osti/35523.pdf. HMF is a starting material for making FDCA through an oxidation reaction, and HMF is obtainable from carbohydrate containing sources such as glucose, fructose, sucrose and starch. *See* the '921 patent (Ex. 1001), 1: 38-42 and 3:1-29.

11. In addition to identifying FDCA as one of 12 priority chemicals for establishing the green chemical industry, the above US Department of Energy

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