

**UNITED STATES PATENT AND TRADEMARK OFFICE**

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**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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**ARKEMA FRANCE,**  
*Petitioner*

**v.**

**HONEYWELL INTERNATIONAL INC.**  
*Patent Owner*

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**Case IPR2015-00916**  
**U.S. Patent No. 8,710,282**

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**DECLARATION OF HSUEH SUNG TUNG, PH.D.**

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I, Hsueh Sung Tung, Ph.D., do hereby declare and say as follows:

**I. EDUCATIONAL AND PROFESSIONAL BACKGROUND**

1. I have personal knowledge of the facts contained in this Declaration, am of legal age, and am otherwise competent to testify.

2. I am one of the named inventors on the above-identified patent by Selma Bektesevic, Hsueh Sung Tung, and Haluk Kopkalli, namely U.S. Patent No. 8,710,282, issued on April 29, 2014 (“the ’282 patent”) from U.S. Application Serial Number 13/229,016, filed September 9, 2011, which claims priority from U.S. Provisional Application No. 61/392,242, filed October 12, 2010. The ’282 patent is also a continuation-in-part of U.S. Application Serial No. 13/195,429, filed August 1, 2011, which is a continuation of U.S. Application Serial No. 12/402,372, filed March 11, 2009, which claims priority from U.S. Provisional Application No. 61/036,526, filed March 14, 2008. I am familiar with the ’282 patent and the teachings discussed therein.

3. I currently serve as the Director of Technology with the Honeywell Fluorine Products strategic business unit in the Performance Materials & Technology strategic business group of Honeywell International Inc. (“Patent Owner”). In this role, I lead the Process Development and Piloting Group consisting of the Process Development, Pilot Plant, and the HF sub-groups.

4. Prior to this role, I was the Technical Manager. In this role, I was responsible for the Process Development sub-group.

5. My education includes a Ph.D. in Chemistry from Michigan State University; a Master's in Chemistry from Eastern New Mexico University; a Master of Business Administration from the State University of New York at Buffalo; and a Bachelor of Engineering in Chemical Engineering from Taipei Institute of Technology (now known as National Taipei University of Technology).

## **II. SCOPE OF THE ENGAGEMENT**

6. I understand that the '282 patent is involved in an Inter Partes Review designated IPR2015-00916 ("IPR"), filed by Arkema France.

7. I offer this declaration to provide factual testimony on behalf of Patent Owner in connection with the IPR. Specifically, I have been limited to providing testimony relating to the facts and circumstances surrounding the conception and reduction to practice of the claimed invention set forth in the '282 patent as described herein.

8. My declaration is based on my role as a named inventor of the '282 patent and as supervisor during the relevant time period. In connection with my testimony, I have reviewed the following when preparing this declaration, namely the '282 Patent and the documents identified as exhibits in my report.

9. I am being compensated as a Honeywell employee for my time spent on the present matter. My compensation is not in any way contingent on my performance, the result of this proceeding, or any of the issues involved therein.

### **III. INVENTION OF THE '282 PATENT**

10. Project Apollo is an investigation into the feasibility of a commercial process and plant for the large scale manufacture of the next generation low global warming potential refrigerant 2,3,3,3-tetrafluoropropene (“HFO-1234yf” or “1234yf”). As part of this project, we evaluated multiple different pathways for the preparation of 1234yf including utilizing hexafluoropropylene (“HFP”) as a starting material, among other possible raw materials.

11. On March 26, 2008, I received an email from Mr. Haluk Kopkalli, including an attachment titled “Apollo HHP + KOH BFD-080318.pdf” which is a document illustrating a potential commercial process including the steps of hydrogenation of HFP, dehydrofluorination with KOH, and regeneration and recycling of spent KOH. Submitted herewith as Exhibit 2007 is a true and accurate copy of the Kopkalli Email dated March 26, 2008 and associated attachments which I received from Mr. Kopkalli in the ordinary course of business. The email demonstrates that we conceived of the idea to use the hydrogenation of HFP and dehydrofluorination with KOH as a possible continuous process for commercial scale-up at least as early as March 26, 2008.

12. My role in Project Apollo at this time was leading the development of the manufacturing technology of 1234yf.

13. As the Director of Technology of Fluorine Products, in accordance with my regular duties in the ordinary course of business, I prepare a monthly highlight document to be provided to the Chief Technology Officer of Fluorine Products, the engineering group, the technical managers of the Fluorine Products plants, and my direct and indirect reports (including engineers and chemists). This monthly highlight document reflects organizational, process development activities, initiatives and some of the invention records for my division. I keep copies of these documents on my computer.

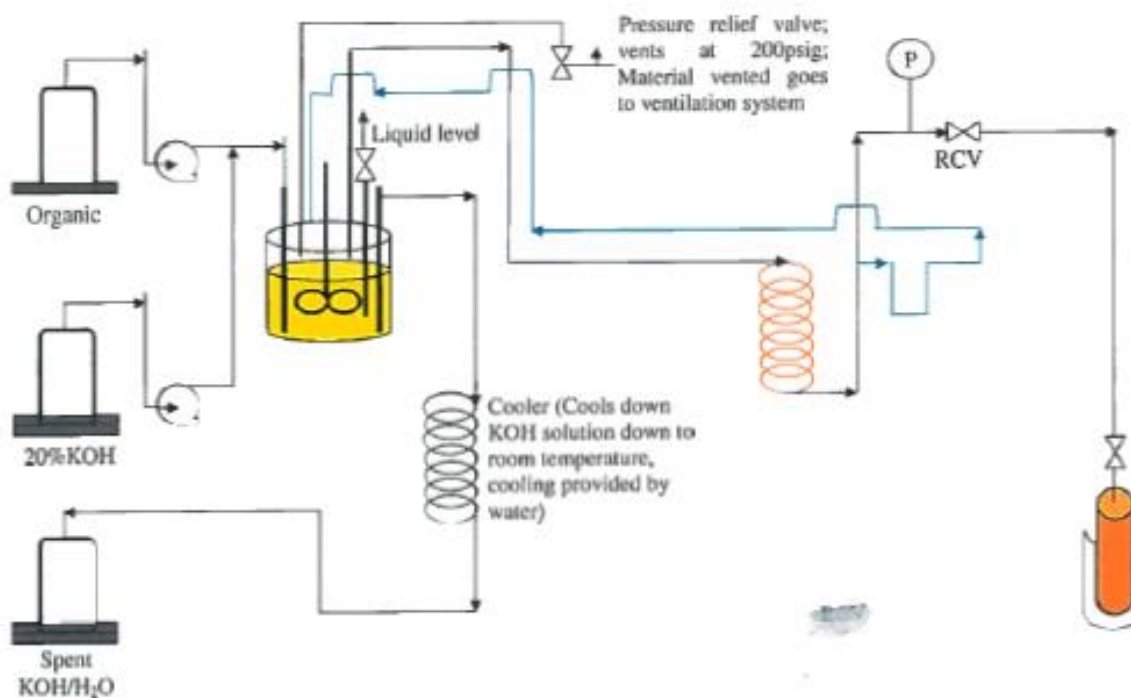
14. At this time, I worked with Dr. Selma Bektesevic, a Senior Research and Development Engineer in the Fluorine Products Division, to further evaluate the manufacture of 1234yf utilizing a caustic reaction for the dehydrofluorination steps.

15. On July 10, 2008, in preparation of such evaluation and pursuant to Honeywell's policy, Dr. Bektesevic submitted a Project Permit Change Form (EX2008) to Permit #626. It is Honeywell's Buffalo Research Laboratory policy to utilize project permits to document the chemicals, processes, safety, regulatory, legal and administrative policies and mandates. The project permit and any change

forms thereto set forth the procedure to be followed and the training required for the employees to run the project, and documents the responsibilities of all involved participants. The project permit and any change forms thereto are signed off and approved by the supervisor, department manager and the health, safety and environmental (“HS&E”) leader before any project can be carried out.

16. The July 10, 2008 Project Permit Change Form indicates that new chemicals 236ea, 245eb, 1234yf, 1225yeZ, and 1225yeE are being introduced into the existing apparatus.

17. The apparatus used in the experiment utilized in the July 10, 2008 Project Permit Change Form is represented by the diagram below (as set forth in EX2009 submitted herewith):



18. The overview of the approach outlined in the July 10, 2008 Project Permit Change Form states that “[t]he reaction proceeds by reacting organic chemicals with KOH to form salts in addition to new chemicals.” The two reactions proposed to be carried out include:  $236ea + KOH \rightarrow 1225ye + KF$  and  $245eb + KOH \rightarrow 1234yf + KF$ .

19. As the Department Manager and Skill Center Leader, it is generally my responsibility to review and sign these permit change forms. I was unable to sign the July 10, 2008 Project Permit Change Form, though I did subsequently review it in accordance with my regular duties. Daniel C. Merkel is my direct report and is generally designated as Department Manager for the process

development group in my absence and is able to sign on my behalf, as he did on this occasion.

20. It was the regular practice of Dr. Bektesevic to prepare and provide to me monthly technology reports reflecting a summary of the experiments and data she has obtained during that month and I incorporated this information in my monthly highlights reports. These reports are provided by Dr. Bektesevic approximately by the 22<sup>nd</sup> of each month, and upon receipt of these reports, it is policy to for me to transfer and preserve copies of these monthly highlight reports on my computer in the ordinary course of business for this purpose as well as provide to others upon request. In addition to preparing monthly reports, we have weekly staff meetings and it is customary for Dr. Bektesevic and I to discuss the experiments she is working on when needed. Further, although I do not recall the specific date, I do recall observing some of the caustic dehydrofluorination experiments in operation in the laboratory.

21. In July 2008, at my direction, Dr. Bektesevic prepared experiments to begin investigating the “[a]pplication of [Continuously Stirred Tank Reactor] CSTR concept on reaction between G-245eb and KOH” to yield 1234yf, as reflected in Dr. Bektesevic’s monthly technology report for July 2008. A true and accurate copy of Dr. Bektesevic’s July 2008 Report which I received in the

ordinary course of business at or near this time is submitted herewith as Exhibit 2010.

22. As would be customary in the ordinary course of business of running experiments in the laboratory, Dr. Bektesevic provides instructions to lab technicians in order to carry out experiments. Accordingly, Dr. Bektesevic prepared and provided instructions to lab technician Angela Mazurkiewicz to perform caustic dehydrofluorination experiments utilizing KOH on July 16, 2008 (“July 16 Instructions”). The July 16 Instructions are submitted here as Exhibit 2011.

23. Dr. Bektesevic also instructed the lab technician to discharge spent KOH from the CSTR and collect the spent KOH in scrubber product collection cylinders (“scrubber PCCs”) containing methylene chloride (“MeCl<sub>2</sub>”). As set forth in Note 2 of the July 16 Instructions, Dr. Bektesevic further noted that the liquid spent KOH samples must be carefully separated as an analysis of such layers would be performed.

24. Appendix 3 attached to Dr. Bektesevic’s July 2008 Monthly Technology Report (“Bektesevic July 2008 Report”), which I received and reviewed at or around that time, reflects the July 16, 2008 data obtained from the

collection of the spent KOH and the separation of spent KOH from everything else, i.e., the dissolved organics (“org”), in the scrubber PCC utilizing MeCl<sub>2</sub>:

	time	total weight	org	KOH	initial MeCl <sub>2</sub>
Weight of scrubber PCC	01:00 - 12:00	2381.053	2371	10.053	2462.7 g
Weight of scrubber PCC	12:00 - 19:00	7526.6	1181.5	6345.1	1632
Weight of scrubber PCC	19:00 - 06:00	8860.2	2062.7	6797.5	2395.3
Weight of scrubber PCC	Cal reactor cont	281.3	106.5	174.8	

25. Dr. Bektesevic’s July 2008 Report states that “[v]apor samples were taken once in 1.5 hour, and liquid samples once in 4 hours.”

26. Appendices 3 and 4 of Dr. Bektesevic’s July 2008 Report further reflect the raw and GC/processed data from the July 16, 2008 experiment, respectively.

27. As would be customary in the ordinary course of business of running experiments in the laboratory, Dr. Bektesevic provides instructions to lab technicians in order to carry out experiments. Dr. Bektesevic prepared and provided instructions to lab technicians Steven Phillips and Angela Mazurkiewicz to perform additional caustic dehydrofluorination experiments utilizing KOH on July 29-30, 2008 (“July 29 Instructions”). The July 29 Instructions are submitted here as Exhibit 2012.

28. As reflected in the July 29 Instructions, Dr. Bektesevic instructed the lab technicians to start the pumps in order to flow 245eb and KOH into the CSTR.

According to the July 29 Instructions, the experiments were run in a “semi-continuous mode” wherein the 1234yf vapor product was constantly removed from the CSTR and the stirrer was stopped periodically and spent KOH was withdrawn from the reactor via a dip tube.

29. As previously stated, Dr. Bektesevic and I have weekly staff meetings and it is customary for Dr. Bektesevic and I to discuss the experiments she is working on when needed. As evidenced by Dr. Bektesevic’s August 2008 Monthly Technology Report (“Bektesevic August 2008 Report”), which I received and reviewed at or around that time, prior experiments had been run in a “‘true’ continuous mode” wherein “[b]oth organic and spent KOH were taken constantly,” the results of which are found in Appendices 1 (raw data) and 2 (GC and processed data). A true and accurate copy of Dr. Bektesevic’s August 2008 Report which I received in the ordinary course of business at or near the time is submitted herewith as Exhibit 2013. Dr. Bektesevic’s August 2008 Report indicates that the major compound formed during this experiment was 1234yf, as expected, and only unreacted 245eb was observed in the scrubber PCC.

30. As indicated in Dr. Bektesevic’s August 2008 Report, outlet valves were opened in order to remove spent KOH from the reactor and collect the spent KOH in a scrubber PCC that had 15% of volume filled with MeCl<sub>2</sub>. At least

portions of Appendices 1, 3, and 5 of the Bektesevic August 2008 Report reflect this separation of the spent KOH from everything else coming out of the outlet valve, i.e., the dissolved organics, in the scrubber PCC utilizing MeCl<sub>2</sub>:

Appendix 1:

	time	total weight	org	KOH	Initial MeCl <sub>2</sub> added
Weight of scrubber PCC #1	18:00 - 03:00	9988	1686.6	8288.4	2355.8 g
Weight of scrubber PCC #2	03:00 - 10:00	9266.3	1780.9	7485.4	1645 g
Weight of scrubber PCC #3	10:00 - 21:00	11966.9	2116.5	9849.4	2366.5 g
Weight of scrubber PCC #4	21:00 - 04:00	8409.3	1465.6	6943.7	1632 g
Weight of scrubber PCC #5	04:00 - 15:00	10203.7	1930.8	8272.9	2370 g
Weight of scrubber PCC #6	15:00 - 22:00	6951.1	709.1	6242	1564.8 g
Weight of scrubber PCC #7	22:00 - 09:00	12140.6	2192.1	9948.5	2458.5 g
Weight of scrubber PCC #8	09:00 - 16:00	7891.4	1473.4	6418	1643.7 g
Weight of scrubber PCC #9	16:00 - 03:00	12311.1	3649.3	8661.8	2433.6 g
Weight of scrubber PCC #10	03:00 - 10:00	4654.9	1570.7	3084.2	1588.2 g
Weight of scrubber PCC #11	10:00 - 12:20	3481.8	2450.1	1031.7	2398.9 g
		0			
Liquid out of Reactor		4848.8	1765.6	3084.2	1524.0 g
Liquid left in the Reactor		#VALUE!	74.1 g		

Appendix 3:

	time	total weight	org	KOH	Initial MeCl <sub>2</sub> added
Weight of 8PCC - 10 min off	04:10 - 04:50	679.1	93.1	586	1099 g
Weight of 8PCC - 5 min off	4:55 - 05:30	500.5	70	430.5	1099 g
Weight of 8PCC - 15 min off	05:30 - 06:15	775.9	83.4	692.5	108.8 g
Weight of 8PCC #1		4972.4	1654	3318.4	1630 g
Weight of 8PCC #2		2391	2271	120	2269.7 g
		0			
Liquid out of Reactor		0			
Liquid left in the Reactor		0			

Appendix 5:

	time	total weight	org	KOH	Initial MeCl <sub>2</sub> added
Weight of 8PCC - 10 min off	3:00 - 3:40	722	83.6	638.4	110.1 g
Weight of 8PCC - 5 min off	3:40 - 4:15	585.1	76.3	508.8	109.8 g
Weight of 8PCC - 15 min off	4:15 - 5:00	722.2	84.5	637.7	110.0 g
Weight of 8PCC #1		4968.5	1384.8	3583.7	1479 g
Weight of 8PCC #2		0			
		0			
Liquid out of Reactor		401.1	0	401.1	
Liquid left in the Reactor		0			

31. Appendices 2, 4, and 6 of Dr. Bektesevic's August 2008 Report further reflect GC and processed data from the above described 245eb experiments conducted in August 2008.

32. Dr. Bektesevic's August 2008 Report also summarizes experiments conducted which reflect the CSTR concept being further applied to the reaction of 236ea and KOH to form 1225ye. The GC data from this experiment is found in Appendix 7 thereto.

33. In preparation of the monthly highlight documents I prepare as the Director of Technology of Fluorine Products, I review the monthly reports of my direct reports. Dr. Bektesevic directly reported to me in July and August 2008. Accordingly, I reviewed and incorporated Dr. Bektesevic's monthly technology reports for July and August 2008 in preparation of my Monthly Highlights for August 2008, which I prepared at or near that time, a true and accurate copy as kept in the ordinary course of business which is submitted herewith as Exhibit 2014.

34. In September 2008, at my direction, Dr. Bektesevic continued to evaluate the dehydrofluorination reaction pathway, specifically with respect to the use of 236ea. Dr. Bektesevic prepared and provided instructions to lab technicians, including Angela Mazurkiewicz, to perform additional caustic dehydrofluorination

experiments utilizing KOH on September 15, 2008 (“September 15 Instructions”), including instructions for HCl titration. The September 15 Instructions are submitted here as Exhibit 2015.

35. As reflected in Dr. Bektesevic’s September 2008 Monthly Technology Report (“Bektesevic September 2008 Report”), which I received at or around that time, such analysis included evaluation of residence times, mass balance, conversion of the organic, and possible inclusion of a catalyst. A true and accurate copy of Dr. Bektesevic’s September 2008 Report which I received in the ordinary course of business at or near that time is submitted herewith as Exhibit 2016.

36. As previously stated, Dr. Bektesevic and I have weekly staff meetings and it is customary for Dr. Bektesevic and I to discuss the experiments she is working on when needed. As part of such experiments and as reflected in the Bektesevic September 2008 Report, Dr. Bektesevic and her lab technicians conducted an experiment on September 15, 2008 (which continued through September 19, 2008) wherein spent KOH was taken out of the reactor intermittently using a 5-inch dip tube. The withdrawn spent KOH was then collected in a scrubber PCC pre-filled with MeCl<sub>2</sub> in order to separate and recover spent KOH from everything else withdrawn, i.e., any dissolved organics, as

reflected in the data set forth in Appendix 1 of the Bektesevic September 2008 Report:

	time	total weight	o/w	KOH	intal MeCl2 added	HCl titration	Sample
Weight of SPCC #1	9/17/2008 23:00	10953.2	2014.7	8938.5	1998.9	7.9ml 37.3% HCl	24ml
Weight of SPCC #2	16:00	6611.4	2367.2	4244.2	1315.5	8.1ml 37.3% HCl	25ml
Weight of SPCC #3	4:00:00 - 21:00	10716.5	2102.9	8613.6	1986.6	8.3ml 37.3% HCl	25ml
Weight of SPCC #4	21:00	5923.1	1797.4	4125.7	1307.4	8.0ml 37.3% HCl	25 ml
Weight of SPCC #5		4226.8	2167.6	2059.2	1968.5	7.6 ml 37.3% HCl	25 ml
		0			1328 g		
Liquid out of Reactor		1372.7		1372.7		3.2 ml 37.3% HCl	25 ml
Liquid left in the Reactor		0					

37. Dr. Bektesevic attempted to determine the strength of the spent KOH using HCl titration at this point, but was unable to do the calculations at this time. As reflected in Dr. Bektesevic's September 2008 Report, analysis of the MeCl<sub>2</sub> layer revealed that about 70 GC area % was 236ea, about 2 GC area % was 1225ye, and the rest included unknown heavy organics.

38. Appendix 2 of Dr. Bektesevic's September 2008 Report further reflects GC and processed data from the September 15-19, 2008 experiment.

39. I reviewed and incorporated Dr. Bektesevic's monthly technology report for September 2008 in preparation of my Monthly Highlights for September 2008, dated September 27, 2008, a true and accurate copy of which is submitted herewith as Exhibit 2017. As I noted in my September 2008 Monthly Highlights Report, as a result of these experiments by Dr. Bektesevic and her team, the "[p]reliminary results demonstrated that CSTR is a feasible option for commercial operation."

40. As indicated in my September 2008 Monthly Highlights Report, based on the data I had reviewed to date at this point in time including the information set forth above, and based on my years of experience in this field and single-pass conversion and selectivity, I understood that there was commercial utility in (i) using a caustic for the dehydrofluorination steps of the HFP process for manufacturing 1234yf and 1225ye; and (ii) withdrawing and recovering the spent dehydrofluorination agent from the reaction.

41. As is typically done in an attempt to place the project in the best position for plant design by the engineering team, further experiments and analysis were performed at my direction in order to improve the quality of the experimental data and to close mass balance. Such further experiments and analysis included fine-tuning residence times, reaction temperatures, agitator speeds, conversion of reaction products, and kinetics of the reaction.

42. In October 2008, at my direction, Dr. Bektesevic and her lab technicians conducted further experiments including a comparison of using different caustics (KOH vs. NaOH) and studying the kinetics of the reaction between 236ea and 25% KOH. As previously stated, Dr. Bektesevic and I have weekly staff meetings and it is customary for Dr. Bektesevic and I to discuss the experiments she is working on when needed. As a result of such experiments,

spent KOH was recovered and analyzed to determine weight % in spent KOH solution (11% for one particular experiment) and separation of dissolved organics. A true and accurate copy of Dr. Bektesevic's October 2008 Report which I received in the ordinary course of business at or near that time is submitted herewith as Exhibit 2018.

43. In November 2008, at my direction, Dr. Bektesevic and her lab technicians conducted further experiments including a comparison between different strengths of KOH and 236ea, different caustics (KOH vs. NaOH), effect of temperature on conversion, selectivity of final products, and the rate constant of the reaction of 236ea and KOH. As previously stated, Dr. Bektesevic and I have weekly staff meetings and it is customary for Dr. Bektesevic and I to discuss the experiments she is working on when needed. A true and accurate copy of Dr. Bektesevic's November 2008 Report which I received in the ordinary course of business at or near that time is submitted herewith as Exhibit 2019.

44. I reviewed and incorporated Dr. Bektesevic's monthly technology report for November 2008 in preparation of my Monthly Highlights for November 2008, at or near that time, a true and accurate copy as kept in the ordinary course of business is submitted herewith as Exhibit 2020. As I noted in my November 2008 Monthly Highlights Report, as a result of these experiments by Dr. Bektesevic and

her team, the “[p]reliminary results indicated that under the same conditions conversion was significantly higher for KOH (62%) than NaOH (28%).” Thus, this analysis confirmed our initial thoughts of using KOH as the caustic for commercial scale-up.

45. In December 2008, at my direction, Dr. Bektesevic and her lab technicians conducted further experiments including studying the kinetics of reaction between 236ea and 25% KOH and studying the dehydrofluorination of 245 with 25% KOH wherein the conversion of 245eb was 99% and the major product was 1234yf (GC area% 98). As previously stated, Dr. Bektesevic and I have weekly staff meetings and it is customary for Dr. Bektesevic and I to discuss the experiments she is working on when needed. A true and accurate copy of Dr. Bektesevic’s December 2008 Report which I received in the ordinary course of business at or near that time is submitted herewith as Exhibit 2021.

46. In January 2009, at my direction, Dr. Bektesevic and her lab technicians conducted additional experiments including further studying the kinetics of the reaction between 236ea and 25% KOH, the kinetics of the reaction between 245eb and 25% KOH, the activation energy of the reaction between 245eb and 25% KOH, and the recycle of KOH used in the dehydrofluorination steps of preparing 1234yf from HFP. As previously stated, Dr. Bektesevic and I have

weekly staff meetings and it is customary for Dr. Bektesevic and I to discuss the experiments she is working on when needed. A true and accurate copy of Dr. Bektesevic's January 2009 Report which I received in the ordinary course of business at or near that time is submitted herewith as Exhibit 2022.

47. I reviewed and incorporated Dr. Bektesevic's monthly technology report for January 2009 in preparation of my Monthly Highlights for January 2009 at or near that time, a true and accurate copy as kept in the ordinary course of business is submitted herewith as Exhibit 2023. As I noted in my January 2009 Monthly Highlights Report, the "[k]inetic studies of the 2<sup>nd</sup> step of the HFP process were completed."

48. In February 2009, at my direction, Dr. Bektesevic and her lab technicians conducted additional experiments including further studying the kinetics of the dehydrofluorination reaction at various temperatures, agitator speeds, and reaction times between 236ea and 25% KOH and between 245eb and 25% KOH. As previously stated, Dr. Bektesevic and I have weekly staff meetings and it is customary for Dr. Bektesevic and I to discuss the experiments she is working on when needed. A true and accurate copy of Dr. Bektesevic's February 2009 Report which I received in the ordinary course of business at or near that time is submitted herewith as Exhibit 2024.

49. I reviewed and incorporated Dr. Bektesevic's monthly technology report for February 2009 in preparation at or near that time of my Monthly Highlights for February 2009, a true and accurate copy as kept in the ordinary course of business is submitted herewith as Exhibit 2025. As I noted in my February 2009 Monthly Highlights Report, as a result of these experiments by Dr. Bektesevic and her team, "[i]t was found that agitation has a significant effect on reaction rate for both steps."

50. In March 2009, at my direction, Dr. Bektesevic and her lab technicians conducted additional experiments including further studying the kinetics of the reactions between 236ea and 25% KOH and between 245eb and 25% KOH. Dr. Bektesevic also began the investigation of other pathways for manufacturing 1234yf via HFP. As previously stated, Dr. Bektesevic and I have weekly staff meetings and it is customary for Dr. Bektesevic and I to discuss the experiments she is working on when needed. A true and accurate copy of Dr. Bektesevic's March 2009 Report which I received in the ordinary course of business at or near that time is submitted herewith as Exhibit 2026.

51. I reviewed and incorporated Dr. Bektesevic's monthly technology report for March 2009 in preparation at or near that time of my Monthly Highlights for March 2009, a true and accurate copy as kept in the ordinary course of business

which is submitted herewith as Exhibit 2027. As I noted in my March 2009 Monthly Highlights Report, the “[k]inetic studies of the 2<sup>nd</sup> and 4<sup>th</sup> steps of the HFP process have been completed.”

52. At the conclusion of the kinetics studies, at my direction, Dr. Bektesevic and her lab technicians began conducting experiments related to the investigation of other pathways for manufacturing 1234yf via HFP.

53. On May 13, 2009, I attended the Project Apollo Technology Meeting and Dr. Bektesevic gave a presentation related to the caustic dehydrofluorination experiments she had conducted. A true and accurate copy of the presentation given by Dr. Bektesevic’s in the ordinary course of business at the meeting on May 13, 2009 is submitted herewith as Exhibit 2028. As reflected in the PowerPoint presented by Dr. Bektesevic at this meeting, she discussed the kinetics of the reactions, agitator speeds, temperatures, activation energy, conversion, reaction times, and possible solutions for addressing unreacted KOH in the plans for commercial scale-up.

54. As a result of this meeting, I instructed Dr. Bektesevic to prepare and submit an invention disclosure based on this data.

55. In August 2009, Dr. Bektesevic prepared and submitted an invention disclosure entitled “Integrated Continuous Process for Dehydrofluorination of

236ea and 245eb” (“Invention Disclosure: H0024680”), a true and accurate copy of which is submitted herewith as Exhibit 2029. Dr. Bektesevic was asked to prepare a further detailed disclosure, a true and accurate copy of which is attached as Exhibit 2030.

#### **IV. PROVISIONAL PATENT APPLICATION**

56. It is my opinion that we went through the necessary steps, as outlined by Honeywell, to diligently prepare and file the patent application leading to the '282 patent.

57. On August 19, 2010, I was copied on an email from James DePasque, a Honeywell patent paralegal, to Joseph Posillico of Fox Rothschild LLP, enclosing Invention Disclosure: H0024680, supporting documentation, and instructions to prepare the provisional patent application. A true and accurate copy of the email I received is submitted herewith as Exhibit 2031.

58. On September 29, 2010, I received an email from Eric Sumner of Fox Rothschild LLP, enclosing the initial draft of the provisional patent application. A true and accurate copy of the email I received is submitted herewith as Exhibit 2032.

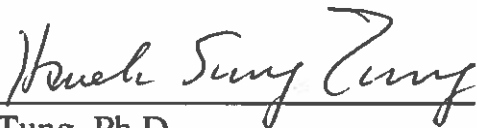
59. On October 1, 2010, I was copied on an email from Dr. Bektesevic to Mr. Sumner asking for additional time to review the provisional patent application and a request to add Mr. Haluk Kopkalli as a co-inventor. A true and accurate copy

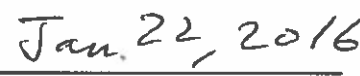
of the email I received is submitted herewith as Exhibit 2033. During the period of October 1 and October 12, I reviewed the draft application as I was available given my other day to day responsibilities. I confirmed that I did not have any additional comments.

60. On October 12, 2010, I was copied on an email from Dr. Bektesevic to Mr. Sumner indicating that she had spoken with Mr. Haluk Kopkalli and me and providing our approval to file the provisional patent application. A true and accurate copy of the email I received is submitted herewith as Exhibit 2034.

61. On October 12, 2010, I was copied on an email Mr. Sumner to Dr. Bektesevic indicating that the provisional patent application would be finalized and filed. A true and accurate copy of the email I received is submitted herewith as Exhibit 2035.

I hereby declare that all statements made herein of my own knowledge are true and that all opinions expressed herein are my own; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

  
\_\_\_\_\_  
Hsueh Sung Tung, Ph.D.

  
\_\_\_\_\_  
Date