NRC FORM 374 U.S. NUCLEAR REGULATORY COMMISSION

Amendment No. 21

MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

C. 03620 315409

Licensee	
1. The Curators of the University of Missouri	**In accordance with letter dated April 27, 2006,**
	3. License number 24-00513-38 is amended in its entirety to read as follows:
2. University of Missouri - St. Louis **1 University Boulevard (102 PTB)** St. Louis, MO 63121-**4400**	4. Expiration date January 31, 2013 5. Docket No. 030-32694 Reference No.

6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
A. Carbon-14	A. Any	A. 30 millicuries
B. Hydrogen-3	B. Any non-volatile	B. 35 millicuries
C. Iodine-125	C. Any non-volatile	C. 20 millicuries
D. Calcium-45	D. Any	D. 10 millicuries
E. Molybenum-99	E. Any	E. 10 millicuries
F. Phosphorus-32	F. Any	F. 120 millicuries
G. Phosphorus-33	G. Any	G. 20 millicuries
H. Sulfur-35	H. Any	H. 80 millicuries
I. Zinc-65	I. Any	I. 10 millicuries
J. Am-241 wrapped with Beryllium for neutron source	J. Troxler Soil Moisture Gauge, Model No. 4302A	J. 10 millicuries
K. Cobalt-60	K. Sealed sources	K. 20 microcuries total
L. Iodine-129	L. Sealed source	L. 0.2 microcurie
M. Polonium-210	M. Sealed sources	M. 2 microcurie total
N. Americium-241	N. Electroplated Needle (Rod)	N. 100 microcuries

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9. Authorized Use:

A. through N. To be used for research and development as defined in 30.4 of 10 CFR Part 30, including metabolic labeling, use as tracers for isotope uptake studies by microorganisms (e.g., yeast cells), in vitro experiments, instrument calibration, student demonstrations, and soil moisture measurements, as described in the letters dated May 19, 1993, and January 14, 2004 (excluding all references to cobalt-57) and the applications dated August 1, 2002, and January 14, 2004 (excluding all references to cobalt-57.)

CONDITIONS

10. A. Licensed material shall be used only at the licensee's facilities located at the University of Missouri - St. Louis, 8001 Natural Bridge Road, St. Louis Missouri.

B. Licensed material listed in Items 6.K. thru 6.M. may be used at temporary jobsites of the licensee anywhere in the United States where the U.S. Nuclear Regulatory Commission maintains jurisdiction for regulating the use of licensed material.

11. The Radiation Safety Officer for this license is Robert M. Wester.

12. A. Licensed material listed in Item 6 above is authorized for use by, or under the supervision of, the following individuals for the materials indicated:

Authorized Users	Materials
Jane A. Starling, Ph.D.	Carbon-14, and hydrogen-3.
Teresa Thiel, Ph.D.	Carbon-14, hydrogen-3, phosphorus-32, sulfur-35, phosphorus-33, molybdenum-99.
Shirley T. Bissen, Ph.D.	Phosphorus-32, and sulfur-35.
F. Keith Stine, Ph.D.	Americium-241.
Claude Fauquet, Ph.D.	Phosphorus-32 and sulfur-35.
Elizabeth A. Kellogg, Ph.D.	Phosphorus-32 and sulfur-35.
Wendy Olivas, Ph.D.	Phosphorus-32 and sulfur-35.
Patricia Parker, Ph.D.	Phosphorus-32.
Cynthia Dupureur, Ph.D.	Carbon-14, hydrogen-3, phosphorus-32 and sulfur-35.

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Marc Spingola, Ph.D.	Phosphorus-32, sulfur-35, Hydrogen-3, carbon-14, and iodine-125.
Colin Mac Diarmid, Ph.D.	Zinc-65, calcium-45, iodine-125, phosphorus-32, *phosphorus*-33, *hydrogen*-3, *sulfur-35 and carbon*-14.
Xuemin (Sam) Wang, Ph.D.	Calcium-45, sulfur-35, phosphorus-32, carbon-14 and hydrogen-3.
Lisa Schechter, Ph.D.	Phosphorus-32 and sulfur-35.

B. Licensed material listed in Items 6.K - 6.O shall only be used by, or under the supervision and in the physical presence of, individuals who have successfully completed the manufacturer's training program for gauge users, have been instructed in the licensee's routine and emergency operating procedures and who have been designated by the Radiation Safety Officer.

13. A. Sealed sources and detector cells shall be tested for leakage and/or contamination at intervals not to exceed 6 months or at such other intervals as specified by the certificate of registration, referred to in 10 CFR 32.210.

B. Notwithstanding Paragraph A of this condition, *sealed sources designed to emit alpha particles* shall be tested for leakage and/or contamination at intervals not to exceed 3 months.

C. In the absence of a certificate from a transferor indicating that a test has been made, a sealed source or detector cell received from another person shall not be put into use until tested.

D. Sealed sources need not be leak tested if:

(i) they contain only hydrogen 3; or

(ii) they contain only radioactive gases; or

(iii) the half-life of the isotope is 30 days or less; or

(iv) they contain not more than 100 microcuries of beta and/or gamma emitting material or not more that 10 microcuries of alpha emitting materials; or

(v) *they are not designed to emit alpha particles, are in storage, and are not being used.* However, when they are removed from storage for use or transferred to another person, and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source or detector cell shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.

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E. The leak test shall be capable of detecting the presence of 0.005 microcurie (185 becquerels) of radioactive material on the test sample. If the test reveals the presence of 0.005 microcurie (185 becquerels) or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission in accordance with 10 CFR 30.50(c)(2), and the source shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Commission regulations.

F. The report shall specify the source involved, the test results, and corrective action taken. Records of leak test results shall be kept in units of microcuries and shall be maintained for inspection by the Commission. Records may be disposed of following Commission inspection.

G. Tests for leakage and/or contamination shall be performed by the licensee or by other persons specifically licensed by the Commission or an Agreement State to perform such services.

14. The licensee shall conduct a physical inventory every 6 months to account for all sources and/or devices received and possessed under the license. Records of inventories shall be maintained for 5 years from the date of each inventory and shall include the quantities and kinds of byproduct material, manufacturer's name and model numbers, location of the sources and/or devices, and the date of the inventory.

15. A. Detector cells containing titanium tritide foil shall only be used in conjunction with a properly operating temperature control mechanism which prevents foil temperatures from exceeding that specified by the manufacturer and approved by NRC.

B. When in use, detector cells containing scandium tritide foil or a scandium tritide foil shall be vented to the outside.

16. Sealed sources or detector cells containing licensed material shall not be opened or sources removed from source holders or detector cells by the licensee.

17. The licensee is authorized to hold radioactive material with a physical half-life of less than or equal to 120 days for decay-in-storage before disposal in ordinary trash provided:

A. Radioactive waste to be disposed of in this manner shall be held for decay a minimum of 10 - half-lives.

B. Before disposal as normal waste, radioactive waste shall be surveyed to determine that its radioactivity cannot be distinguished from background. All radiation labels shall be removed or obliterated.

C. A record of each disposal permitted under this license condition shall be retained for three years. The record must include the date of disposal, the date on which the byproduct material was placed in storage, the radionuclides disposed, the survey instrument used, the background dose rate, the dose rate measured at the surface of each waste container, and the name of the individual who performed the disposal.

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D. Radioactive waste being held for decay shall not be stored for a period greater than 4 years.

18. Radioactive waste other than that specified in Condition 17. shall not be stored for a period greater than 2 years.

19. Radioactive waste currently possessed exceeding the storage provisions of Condition Nos. 17.D., and 18. shall be disposed of within one year of the issuance of this license.

20. This license does not authorize commercial distribution of licensed material.

21. The licensee shall not use licensed material in or on human beings except as provided otherwise by specific condition of this license.

22. The licensee shall not use licensed material in field applications where activity is released except as provided otherwise by specific condition of this license.

23. When performing tests at temporary job sites, the authorized user shall not leave the moisture/density gauge unattended. Upon completion of tests the device shall be locked in the licensee's vehicle or a secure building to prevent unauthorized use, loss, or theft.

24. Any cleaning, maintenance, or repair of the devices that requires removal of the source rod shall be performed only by the manufacturer or by other persons specifically licensed by the Commission or an Agreement State to perform such services.

25. In addition to the possession limits in Item 8, the licensee shall further restrict the possession of licensed material to quantities below the minimum limit specified in 10 CFR 30.35(d) for establishing decommissioning financial assurance.

26. Each portable nuclear gauge shall have a lock or other locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The gauge or its container must be locked when in transport, storage, or when not under the direct surveillance of an authorized user.

27. The licensee is authorized to transport licensed material only in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

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28. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents including any enclosures, listed below. The Nuclear Regulatory Commission's regulations shall govern unless the statements, representations and procedures in the licensee's application and correspondence are more restrictive than the regulations.

A. Applications dated February 28, 1992, August 1, 2002 (with attachments) and January 14, 2004 (excluding all references to cobalt-57);

B. Letters dated July 20, 1992, January 15, 1997, October 15, 1998, February 17, 2000, August 14, 2001, December 5, 2001 (excluding Item No. 3.), January 14, 2004 (excluding all references to cobalt-57) , July 8, 2004, March 4, 2005 (limited to the authorized locations of use for Dr. Wang's research and his application to use licensed material), May 9, 2005, June 16, 2005, November 15, 2005, **and April 27, 2006**; and,

C. Facsimiles dated May 4, 2000, January 15, 2003 (with attachments) and April 14, 2004.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Date MAY 30 2006

By Colleen Carol Casey
Colleen Carol Casey
Materials Licensing Branch
Region III