

STATEMENT OF CONSIDERATION

REQUEST BY INVENTORS FOR WAIVER OF DOMESTIC AND FOREIGN RIGHTS TO INVENTIONS MADE
IN RELATION TO:

IMPACT-INDICATING COATINGS

THE ABOVE-REFERENCED INVENTION BEING DEVELOPED UNDER DOE CONTRACT
DE-AC52-06NA25396, DOE INVENTION DISCLOSURE S-129838; WAIVER No.:
W(I) 2021-0001.

The petitioners for the above-referenced subject matter technology, inventors Karl K. Jonietz and David Thorn (hereinafter referred to as Petitioners) request a waiver for all domestic and foreign patent rights to inventions that may be conceived or first actually reduced-to-practice in the course of the project work tasks that are proposed according to agreements between Los Alamos National Security (hereinafter referred to as LANS), now TRIAD National Security (hereinafter referred to as TRIAD) and DOE/NNSA (B&R Code XA 31/YN0100000).

During the course of their employment at Los Alamos National Laboratory (hereinafter referred to as LANL), the Petitioners developed the present invention. The project was funded by LANS, now TRIAD. The concept was performed in advance developing the relationship between TRIAD and Boeing as part of the Petitioners' job responsibilities to TRIAD technology transfer and science missions, subject to DOE contract number DE- AC52-06NA25396 at the time the invention was conceived. No Government funds were committed to developing the concept to its present state. Further development is likely to be required and the Petitioners are looking to partner with universities or other entities to make this development into a technological viability.

The invention relates to a coating, resembling a conventional paint coating which contains within it small bodies that will change color if they experience a mechanical impact, and thereby alert a user to potential damage. More specifically, the invention relates to composite materials used to make an object where material integrity is significant.

Petitioners have experience in private-sector commercial R&D activities, and extensive contacts with university and private-sector practitioners who have experience with the relevant polymer and coatings chemistries needed to develop the present concept into viable technology. Petitioners also have experience with related indicating and detecting technologies. See Thom, Jonietz et al., US Patents 7,915,047 ('047) and 8,470,933 ('933) "Coating for leak detection and method." The patents are directed to using rupture of capsules to cause a color change that reports an event. US Patent '047 employs small capsules within coatings to sense and report large, consequential events and launches a potential portfolio in capsule and coating design for targeted sensing and reporting. US Patent '933 is directed to methods of detecting fluid leaks comprising a surface coating of polymer and catalyst.

The Petitioners' unique approach overcomes several challenges to generate impact sensing coating to be applied to composite material in aircraft bodies and wings where impact indicating color would not materially alter the object or its performance in use. Moreover, it offers a uniform degree of impact/damage detection over the entire object, as well as, withstand temperature extremes and tuned compatibility with other paintings and markings applied to the object.

Specifically, the Petitioners intend to establish a private small-entity LLC under which they will launch partnerships with university teams or other entities having the necessary expertise in polymer technology, impact sensing and structural health monitoring, and use these partnerships to develop the concept into technological viability. Once the technology is developed, Petitioners' LLC will pursue partnerships with commercial coatings companies to refine the technology into practical utility. Neither the Petitioners nor to their knowledge any other entity presently has a commercial position dedicated to impact-indicating coatings. Petitioners noted however that since the concept was originally developed, research teams in China and Russia have published scientific articles relevant to impact indication which suggest that companies might very soon be started in these countries.

As far as the Petitioners know, there has been no effort anywhere in DOE to develop the subject concept into a viable technology since the concept was disclosed about 9 years ago. To develop this concept now requires particular polymer and coatings expertise that does not appear to be present within the DOE. Moreover, the polymer platforms that are most promising to advance the subject concept require intellectual property already owned by universities. The Petitioners believe they and their LLC are the best entities now to launch the necessary partnerships and to promote the necessary development and commercialization effort. Potential licensees could include the commercial coatings companies that provide paint to airplane manufacturers and airline companies. Once the rights requested are granted to the Petitioners, discussions with these companies can begin. It is important to emphasize, that, given the lapse of time, no guarantees can be made as to patentability, further development, and/or commercialization of this concept.

The invention does not apply to the Naval Nuclear Propulsion Program or to the nuclear weapons programs or other nuclear or atomic energy defense activities of DOE.

Petitioners have agreed to abide by 35 U.S.C. §§ 202, 203 and 204. Petitioners, as part of their petition, have agreed to the provisions of the U.S. Competitiveness Clause, which reads as follows: "The Petitioners agree that any product embodying any waived invention or produced through the use of any waived invention will be manufactured substantially in the United States, unless Petitioners can show to the satisfaction of DOE that it is not commercially feasible to do so. In the event DOE agrees to foreign manufacture, there will be a requirement that the Government's support of the technology be recognized in some appropriate manner, e.g., recoupment of Government investment, etc." Furthermore, Petitioners have agreed to make this condition binding on any assignee or licensee. Petitioners will also abide by the Export Control laws and will require licensees, if any, to do the same.

Granting the waiver is the only way to promote any commercial utilization of this invention. The inventors' interest in obtaining title and actively seeking commercialization sufficiently satisfies DOE/NNSA's technology transfer mission without the need to expend additional funds.

The potential field of application (if the concept is successfully developed into viable technology) would enhance personal or public safety, by indicating to users that their device has experienced a mechanical impact, so that the user can assess whether this impact might have safety consequences and address them if necessary.

Petitioners hope that by receiving rights to this concept, they will help US companies develop a significant technology base in the impact-indicating coatings field, and thereby establish a US presence in this field. Petitioners note that the DOE has declined to take action on this concept, so unless the waiver is granted and the Petitioners have rights to this concept and freedom to operate, this concept will never be realized in the market by US companies. In this regard, Petitioners point out publications by researchers at Shandong, Lanzhou, and Jiangnan Universities in China, and at South Ural State University in Russia, which signal that the US is significantly lagging in this field.

The publications, and corresponding competitive technologies, of which the Petitioners are aware include:

a) "Microcapsule-Based Visualization Smart Sensors for Damage Detection: Principles & Applications," Zheng et al., *Adv. Mat. Technol.* 2019, <https://doi.org/10.1002/admt.201900832>).

The publication discloses microcapsules encapsulated with solutions of dye or indicators. When protective shell of microcapsules is broken, the dye will be released and activated under optical, chemical, or mechanical conditions. The microcapsules can be added to interior of structure or prepared as a coating to provide structural health monitoring of interior and surface of the structure.

b) "Fabrication of self-reactive microcapsules as color visual sensing for damage reporting," Zheng et al, *J. Mat. Sci.* 2020, <https://link.springer.com/article/10.1007%2Fs10853-02004668-6>.

The publication discloses indicator dye encapsulated in a polymer shell activated with surface activator. The microcapsules are used as visual sensor and highlight surface damage.

c) "Robust Damage-Reporting Strategy Enabled by Dual-Compartment Microcapsules," Chen et al., *ACS Appl. Mater. Interfaces* 2021, <https://doi.org/10.1021/acsami.0c20276>).

The publication discloses dye filled microcapsules with dual compartment design for efficient and sensitive detection of early stage microcracks.

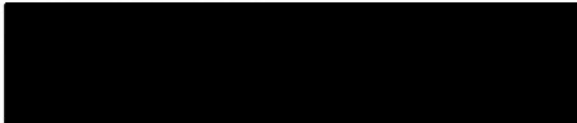
d) "The new indicator coating to detect the place of barely visible impacts on aircraft composite structures," Buslaeva et al, *IOP Conference Series: Mat. Sci. Eng.* 2020, <https://iopscience.iop.org/article/10.1088/1757-899X/1024/1/012002>.

The publication discloses indicator coating (IC) based on polymer matrix with hollow glass microspheres. The coating can be used for visual detection of subtle changes that occur in aircraft structural elements under local impact.

Petitioners are acting at this time because the Government has declined to act on subject concept and non-US entities are now independently developing and acting upon the concept. Moreover, there are recent and relevant research which could bring technological approaches having distinct advantages over international competition to address the impact indicating technology goal.

As such, upon evaluation of the Waiver Petition and in view of the objectives and considerations set forth in 10 CFR 784, all of which have been considered, it is recommended that the requested waiver be granted.

Date


Carmen Ekstrom
NNSA Patent Attorney

Based on the foregoing Statement of Considerations and the representations of the attached Waiver Petition, it is determined that the interests of the United States and the general public will best be served by a waiver of patent rights of the scope described above and, therefore, the waiver is granted.

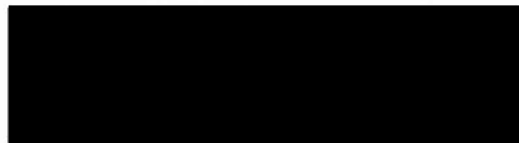
CONCURRENCE:



Kathleen H. McDonald
Program Manager
Technology Transfer Division
Los Alamos National Security LLC

Date: _____

APPROVAL:



Brian Lally
Assistant General Counsel
For Technology Transfer and
Intellectual Property (GC-62)

Date: _____