BIOMOLECULAR PROGRAMMING OF DISCRETE NANOMATERIALS FOR SENSORS, TEMPLATES AND MIMICS OF NATURAL NANOSCALE ASSEMBLIES

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10/17/2016
Final Report
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1. REPORT DATE (DD-MM-YYYY) 08-11-2016
2. REPORT TYPE Final Performance
3. DATES COVERED (From - To) 01 Jun 2011 to 31 May 2016

4. TITLE AND SUBTITLE
BIOMOLECULAR PROGRAMMING OF DISCRETE NANOMATERIALS FOR SENSORS, TEMPLATES AND MIMICS OF NATURAL NANOSCALE ASSEMBLIES

5a. CONTRACT NUMBER

5b. GRANT NUMBER
FA9550-11-1-0105

5c. PROGRAM ELEMENT NUMBER
61102F

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
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LA JOLLA, CA 92037-0621 US

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
AF Office of Scientific Research
875 N. Randolph St. Room 3112
Arlington, VA 22203

10. SPONSOR/MONITOR’S ACRONYM(S)
AFRL/AFOSR RTB2

11. SPONSOR/MONITOR’S REPORT NUMBER(S)
AFRL-AFOSR-VA-TR-2016-0343

12. DISTRIBUTION/AVAILABILITY STATEMENT
A DISTRIBUTION UNLIMITED: PB Public Release

13. SUPPLEMENTARY NOTES

14. ABSTRACT
We have worked on the development of biomolecule-polymer conjugates as responsive elements for assembly of complex morphology switchable nanomaterials, and have combined this with an effort in nature-inspired materials with a particular focus on synthetic, or artificial polymeric organelles, including melanosomes. Relevance of these projects to the DOD interests include the possibility of employing the resulting materials in advanced biochemical sensors, where recognition elements combined with stability and long term use are needed; hence our interest in stabilized but responsive biomolecular materials and conjugates between 2011 and 2016. In terms of melanin work, we see strong relevance in these bioinspired materials that are capable of acting as structural color elements, with unusually high refractive indices and with an understanding of synthetic processes leading to morphological control. This would lead to an ability to develop materials that have iridescent structural color, but capable of broad band absorbance, combined with unusual magnetic properties. The fact that very little is known about their natural biosynthesis, and their properties in general, means there is a rich source of chemical information to mine, and potentially utilize in new device applications. Thirdly, we have developed liquid cell TEM (LCTEM) as a means for studying these complex responsive systems.

15. SUBJECT TERMS
nanomaterials, sensors, templates

16. SECURITY CLASSIFICATION OF:

DISTRIBUTION A: Distribution approved for public release.

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