

Appendix 4A-1. Two-Page Area Summaries by Individual Investigators

For each area demonstration, two-page summaries from each investigator and supplemental information are available on the NNCTA website (nncta.org).

Appendix table 4A-2. Selected examples of emerging areas based on keyword search of publications, 2012–18

Year	Keywords	Representative papers
2012	['robust estimation,' 'optical waveguides,' 'batteries,' 'finite difference,' 'li4ti5o12,' 'wettability,' 'optical absorption,' 'cavitation erosion,' 'biomimetic,' 'seismic hazard,' 'superhydrophobicity,' 'chlorophyll a fluorescence']	Biodegradable black phosphorus-based nanospheres for in vivo photothermal cancer therapy
2016	['organic semiconductor,' 'organic field-effect transistor,' 'public interest,' 'autolysis,' 'surfaces and interfaces']	Borophene: a promising anode material offering high specific capacity and high rate capability for lithium-ion batteries
2016	['high speed,' 'organic semiconductors,' 'thermal radiation,' 'charge transport,' 'organic light-emitting diode,' 'copper nanoparticles']	Functional gradients and heterogeneities in biological materials: Design principles, functions, and bioinspired applications
2018	['image recognition,' 'image restoration,' 'matrix factorization,' 'manifold learning,' 'image denoising,' 'semi-supervised learning']	Parameter-free auto-weighted multiple graph learning: A framework for multiview clustering and semi-supervised classification
2018	['dos,' 'excitons,' 'organic photovoltaics,' 'boron nitride,' 'nanocatalyst,' 'electrochemical properties,' 'tin dioxide,' 'macrocycles,' 'photonic crystals,' 'capacitance,' 'transition metal,' 'clusters,' 'dye-sensitized solar cell,' 'optical absorption,' 'microwave synthesis,' 'mof,' 'spectroelectrochemistry,' 'li-ion batteries,' 'ferrocene,' 'organic light-emitting diodes,' 'oled,' 'metal oxide']	Zirconium nitride catalysts surpass platinum for oxygen reduction