

# JARAD A. MASON

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Jarad earned B.S. and M.S. degrees in Chemistry at the University of Pennsylvania in 2009. While at Penn, he worked in the lab of Professor Larry Sneddon on the synthesis of ultra-high-temperature ceramics from polymer precursors and on the development of new electrolytes for lithium ion batteries. He obtained his Ph.D. in Chemistry from the University of California, Berkeley in 2015 under the guidance of Jeffrey Long. At Berkeley, Jarad investigated the storage and separation of gases in metal-organic frameworks.

Following graduate school, he was a postdoctoral fellow with Chad Mirkin at Northwestern University where he used DNA to assemble responsive materials composed of inorganic nanoparticle building blocks.

In January 2018, Jarad began his independent career as an Assistant Professor in the Department of Chemistry and Chemical Biology at Harvard University. His research group applies the tools of synthetic chemistry and nanoscience to design materials that address basic science challenges in energy and sustainable development, with a particular emphasis on the development of chemical strategies—drawing heavily from coordination chemistry—to manipulate entropic effects, phase transitions, and porosity at different length scales in metal-organic materials.

## PROFESSIONAL APPOINTMENTS

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<i>Harvard University</i>	<b>2018</b> –current
Assistant Professor of Chemistry & Chemical Biology	<b>2015</b> – <b>2017</b>
Faculty Associate, Harvard University Center for the Environment	
Member, Harvard Quantum Initiative	
<i>Northwestern University</i>	
Postdoctoral Associate (Advisor: Chad A. Mirkin)	
Research focus: DNA-mediated assembly of plasmonic nanoparticles	

## EDUCATION

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<i>University of California, Berkeley</i>	<b>2010</b> – <b>2015</b>
<b>Ph.D.</b> in Chemistry (Advisor: Jeffrey R. Long)	<b>2005</b> – <b>2009</b>
Thesis: Metal-Organic Frameworks for Gas Storage and Separation	
<i>University of Pennsylvania</i>	
<b>M.S.</b> in Chemistry (Advisor: Larry G. Sneddon)	
Thesis: The Development of Novel Borate Anions for Use as Electrolytes in Lithium-Ion Batteries	
<b>B.A.</b> <i>summa cum laude</i> in Chemistry (minors: Mathematics and Economics)	

## RESEARCH INTERESTS

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Synthesis of metal-organic materials with an emphasis on the development of strategies to control structure and porosity at multiple length scales; chemical approaches to manipulating entropy and

thermally induced phase transitions in extended solids and nanocrystal-based materials; design of materials for thermal energy storage, heat management, and solid-state cooling; melting and crystallization phenomena, metal-organic glasses; gas adsorption in porous solids; porosity and gas absorption in liquids.

## AWARDS AND HONORS

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Department of Energy Early Career Award	2020
Scialog Fellow for Negative Emissions Science	2020
George W. Merck Fellow	2020
Beckman Young Investigator Award	2019
Climate Change Solutions Fund	2019
Office of Naval Research Young Investigator Award	2019
Milton Fund Award	2018
Omar Farha Award for Research Leadership, Northwestern University	2016
International Institute for Nanotechnology Outstanding Research Award	2016
Reaxys PhD Prize Finalist	2016
Dan David Prize Postdoctoral Scholarship	2016
ACS Division of Inorganic Chemistry Young Investigator Award	2016
International Institute for Nanotechnology Postdoctoral Fellowship	2015
Chevron Research Fellowship	2014
Graduate Student Gold Award, Materials Research Society	2014
Glenn Award for the Division of Fuel Chemistry, American Chemical Society	2011
International Center for Materials Research Fellowship, Università Dell'Insubria	2011
National Science Foundation Graduate Research Fellowship	2009
Priestley Club Award, University of Pennsylvania	2009
Vagelos Science Challenge Award, University of Pennsylvania	2008
Phi Beta Kappa, University of Pennsylvania	2008
Hypercube Award for Computational Chemistry, University of Pennsylvania	2007

## SCIENTIFIC PUBLICATIONS (H-index: 34, total citations: 11,230; ORCID: 0000-0003-0328-7775)

- (49) McGillicuddy, R. D.; Thapa, S.; Wenny, M. B.; Gonzalez, M. I.; Mason, J. A. "Metal-Organic Phase-Change Materials for Thermal Energy Storage" Submitted.
- (48) Siegelman, R. L.; Thompson, J. A.; Mason, J. A.; McDonald, T. M.; Long, J. R. *Energy Environ. Sci.* "A Cooperative Adsorbent for the Switch-Like Capture of Carbon Dioxide from Crude Natural Gas" Submitted.
- (47) Zhou, W.; Lin, Q.-Y.; Mason, J. A.; Dravid, V. P.; Mirkin, C. A. "Design Rules for Template-Confined DNA-Mediated Nanoparticle Assembly" *Small* **2018**, *14*, 1802742.
- (46) Taylor, M. K.; Runčevski, T.; Oktawiec, J.; Bachman, J. E.; Siegelman, R. L.; Jiang, H. Z. H.; Mason, J. A.; Tarver, J. D.; Long, J. R. "Near-Perfect CO<sub>2</sub>/CH<sub>4</sub> Selectivity Achieved through Reversible Guest Templating in the Flexible Metal-Organic Framework Co(bdp)" *J. Am. Chem. Soc.* **2018**, *140*, 10324–10331.

- (45) Aubrey, M. L.; Wiers, B. M.; Andrews, S. C.; Sakurai, T.; Reyes-Lillo, S. E.; Hamed, S. M.; Yu, C.-J.; Darago, L. E.; Mason, J. A.; Baeg, J.-O.; Grandjean, F.; Long, G. J.; Seki, S.; Neaton, J. B.; Yang, P.; Long, J. R. "Electron Delocalization and Charge Mobility as a Function of Reduction in a Metal-Organic Framework" *Nat. Mater.* **2018**, *17*, 625–632.
- (44) Wang, S.; McGuirk, M.; d'Aquino, A.; Mason, J. A.; Mirkin, C. A. "Metal-Organic Framework Nanoparticles" *Adv. Mater.* **2018**, *30*, 1800202.
- (43) Lin, Q.-Y.; Palacios, E.; Zhou, W.; Li, Z.; Mason, J. A.; Liu, Z.; Lin, H.; Chen, P.-C.; Dravid, V. P.; Aydin, K.; Mirkin, C. A. "DNA-Mediated Size-Selective Nanoparticle Assembly for Multiplexed Surface Encoding" *Nano Lett.* **2018**, *18*, 2645–2649.
- (42) Gonzalez, M. I.; Kapelewski, M. T.; Bloch, E. D.; Milner, P. J.; Reed, D. A.; Hudson, M. R.; Mason, J. A.; Barin, G.; Brown, C. M.; Long, J. R. "Separation of Xylene Isomers through Multiple Metal Site Interactions in Metal-Organic Frameworks" *J. Am. Chem. Soc.* **2018**, *140*, 3412–3422.
- (41) Lin, Q.-Y.;<sup>†</sup> Mason, J. A.;<sup>†</sup> Li, Z.;<sup>†</sup> O'Brien, M. N.; Brown, K. A.; Jones, M. R.; Zhou, W.; Butun, S.; Dravid, V. P.; Aydin, K.; Mirkin, C. A. "Building Superlattices from Individual Nanoparticles via Template-Confined DNA-Mediated Assembly" *Science* **2018**, *359*, 669–672. <sup>†</sup>Equal author contribution.
- (40) Reed, D. A.; Keitz, B. K.; Oktawiec, J.; Mason, J. A.; Runčevski, T.; Xiao, D. J.; Darago, L. E.; Crocellà, V.; Bordiga, S.; Long, J. R. "A Spin Transition Mechanism for Cooperative Adsorption in Metal-Organic Frameworks" *Nature* **2017**, *550*, 96–100.
- (39) Siegelman, R. L.; McDonald, T. M.; Gonzalez, M. I.; Martell, J.; Milner, P. J.; Mason, J. A.; Berger, A. H.; Bhowan, A. S.; Long, J. R. "Controlling Cooperative CO<sub>2</sub> Adsorption in Diamine-Appended Mg<sub>2</sub>(dobpdc) Metal-Organic Frameworks" *J. Am. Chem. Soc.* **2017**, *139*, 10526–10538.
- (38) Vlaisavljevich, B.; Huck, J. M.; Hulvey, Z.; Lee, K.; Mason, J. A.; Neaton, J. B.; Long, J. R.; Brown, C. M. Alfè, D.; Michaelides, A.; Smit, B. "Performance of Van der Waals Corrected Functionals for Guest Adsorption in a Series of Metal-Organic Frameworks" *J. Phys. Chem. A* **2017**, *121*, 4139–4151.
- (37) Gonzalez, M. I.; Mason, J. A.; Bloch, E. D.; Teat, S. J.; Gagnon, K. J.; Morrison, G. Y.; Queen, W. L.; Long, J. R. "Structural Characterization of Framework-Gas Interactions in the Metal-Organic Framework Co<sub>2</sub>(dobdc) by *in situ* Single-Crystal X-ray Diffraction" *Chem. Sci.* **2017**, *8*, 4387–4398.
- (36) Gómora-Figueroa, A. P.; Mason, J. A.; Gonzalez, M. I.; Bloch, E. D.; Meihaus, K. R. "Metal Insertion in a Methylamine-Functionalized Zirconium Metal-Organic Framework" *Inorg. Chem.* **2017**, *56*, 4308–4316.
- (35) DeSantis, D.; Mason, J. A.; James, B. D.; Houchins, C.; Long, J. R.; Veenstra, M. "Techno-Economic Analysis of Metal-Organic Frameworks for Hydrogen and Natural Gas Storage" *Energy Fuels* **2017**, *31*, 2024–2032.
- (34) Taylor, M. K.; Runčevski, T.; Oktawiec, J.; Gonzalez, M. I.; Siegelman, R. L.; Mason, J. A.; Ye, J.; Brown, C. M.; Long, J. R. "Tuning the Adsorption-Induced Phase Change in the Flexible Metal-Organic Framework Co(bdp)" *J. Am. Chem. Soc.* **2016**, *138*, 15019–15026.
- (33) Levine, D. J.; Runčevski, T.; Kapelewski, M. T.; Keitz, B. K.; Oktawiec, J.; Reed, D.

- A.; Mason, J. A.; Jiang, H. Z. H.; Colwell, K. A.; Legendre, C.; FitzGerald, S. A.; Long, J. R. "Olsalazine-Based Metal-Organic Frameworks as Biocompatible Platforms for H<sub>2</sub> Adsorption and Drug Delivery" *J. Am. Chem. Soc.* **2016**, *138*, 10143–10150.
- (32) Ashley, M. J.; O'Brien, M. N.; Hedderick, K. R.; Mason, J. A.; Ross, M. B.; Mirkin, C. A. "Templated Synthesis of Uniform Perovskite Nanowire Arrays" *J. Am. Chem. Soc.* **2016**, *138*, 10096–10099.
- (31) Mason, J. A.; Laramy, C. R.; Lai, C.-T.; O'Brien, M. N.; Lin, Q.-Y.; Dravid, V. P.; Schatz, G. C.; Mirkin, C. A. "Contraction and Expansion of Stimuli-Responsive DNA Bonds in Flexible Colloidal Crystals" *J. Am. Chem. Soc.* **2016**, *138*, 8722–8725.
- (30) Mercado, R.; Vlasisavljevich, B.; Lin, L.-C.; Lee, K.; Lee, Y.; Mason, J. A.; Xiao, D. J.; Gonzalez, M.; Kapelewski, M. T.; Neaton, J. B.; Smit, B. "Force Field Development from Periodic Density Functional Theory Calculations for Gas Separation Applications Using Metal-Organic Frameworks" *J. Phys. Chem. C* **2016**, *120*, 12590–12604.
- (29) Bloch, E. D.; Queen, W. L.; Hudson, M. R.; Mason, J. A.; Xiao, D. J.; Murray, L. J.; Flacau, R.; Brown, C. M.; Long, J. R. "Hydrogen Storage and Selective, Reversible O<sub>2</sub> Adsorption in a Metal-Organic Framework with Open Chromium(II) Sites" *Angew. Chem. Int. Ed.* **2016**, *55*, 8605–8609.
- (28) Demir, S.; Brune, N. K.; Van Humbeck, J. F.; Mason, J. A.; Plakhova, T. V.; Wang, S.; Tian, G.; Minasian, S. G.; Tyliszczak, T.; Yaita, T.; Kobayashi, T.; Kalmykov, S. N.; Shiwaku, H.; Shuh, D. K.; Long, J. R. "Extraction of Lanthanide and Actinide Ions from Aqueous Mixtures Using a Carboxylic Acid-Functionalized Porous Aromatic Framework" *ACS Cent. Sci.* **2016**, *2*, 253–265.
- (27) Tsvion, E.; Mason, J. A.; Gonzalez, M. I.; Long, J. R.; Head-Gordon, M. "A Computational Study of CH<sub>4</sub> Storage in Porous Framework Materials with Metalated Linkers: Connecting the Atomistic Character of CH<sub>4</sub> Binding Sites to Usable Capacity" *Chem. Sci.* **2016**, *7*, 4503–4518.
- (26) Gygi, D.; Bloch, E. D.; Mason, J. A.; Hudson, M. R.; Gonzalez, M. I.; Siegelman, R. L.; Darwish, T. A.; Queen, W. L.; Brown, C. M.; Long, J. R. "Hydrogen Storage in the Expanded Pore Metal-Organic Frameworks M<sub>2</sub>(dobpdc) (M = Mg, Mn, Fe, Co, Ni, Zn)" *Chem. Mater.* **2016**, *28*, 1128–1138.
- (25) Gallagher, A. T.; Kelty, M. L.; Park, J. G.; Anderson, J. S.; Mason, J. A.; Collins, S. L.; Harris, T. D. "Dioxygen Binding at a Four-Coordinate Cobaltous Porphyrin Site in a Metal-Organic Framework" *Inorg. Chem. Front.* **2016**, *3*, 536–540.
- (24) Mason, J. A.; Oktawiec, J.; Taylor, M. K.; Hudson, M. R.; Rodriguez, J.; Bachman, J. E.; Gonzalez, M. I.; Cervellino, A.; Guagliardi, A.; Brown, C. M.; Llewellyn, P. L.; Masciocchi, N.; Long, J. R. "Methane Storage in Flexible Metal-Organic Frameworks with Intrinsic Thermal Management" *Nature* **2015**, *527*, 357–361.
- (23) Mason, J. A.; Darago, L. E.; Lukens, W. W. Jr.; Long, J. R. "Synthesis and O<sub>2</sub> Reactivity of a Titanium(III) Metal-Organic Framework" *Inorg. Chem.* **2015**, *54*, 10096–10104.
- (22) Hulvey, Z.; Vlasisavljevich, B.; Mason, J. A.; Tsvion, E.; Dougherty, T. P.; Bloch, E. D.; Head-Gordon, M.; Smit, B.; Long, J. R.; Brown, C. M. "Critical Factors Driving the High Volumetric Uptake of Methane in Cu<sub>3</sub>(btc)<sub>2</sub>" *J. Am. Chem. Soc.* **2015**, *137*, 10816–10825.
- (21) Mason, J. A.; McDonald, T. M.; Bae, T.-H.; Bachman, J. E.; Sumida, K.; Dutton, J. J.; Kaye, S. S.; Long, J. R. "Application of a High-Throughput Analyzer in Evaluating Solid

- Adsorbents for Post-Combustion Carbon Capture via Multicomponent Adsorption of CO<sub>2</sub>, N<sub>2</sub>, and H<sub>2</sub>O” *J. Am. Chem. Soc.* **2015**, *137*, 4787–4803.
- (20) McDonald, T. M.; Mason, J. A.; Kong, X.; Bloch, E. D.; Gygi, D.; Dani, A.; Crocellà, V.; Giordanino, F.; Odoh, S. O.; Drisdell, W. S.; Vlaisavljevich, B.; Dzubak, A. L.; Poloni, R.; Schnell, S. K.; Planas, N.; Lee, K.; Pascal, T.; Wan, L. F.; Prendergast, D.; Neaton, J. B.; Smit, B.; Kortright, J. B.; Gagliardi, L.; Bordiga, S.; Reimer, J. A.; Long, J. R. “Cooperative Insertion of CO<sub>2</sub> in Diamine-Appended Metal-Organic Frameworks” *Nature* **2015**, *519*, 303–308.
- (19) Gonzalez, M. I.; Bloch, E. D.; Mason, J. A.; Teat, S. J.; Long, J. R. “Single-Crystal-to-Single-Crystal Metalation of a Metal-Organic Framework: A Route Toward Structurally Well-Defined Catalysts” *Inorg. Chem.* **2015**, *54*, 2995–3005.
- (18) Chen, J. J.; Mason, J. A.; Bloch, E. D.; Gygi, D.; Long, J. R.; Reimer, J. A. “NMR Relaxation and Exchange in Metal-Organic Frameworks for Surface Area Screening” *Microporous Mesoporous Mater.* **2015**, *205*, 65–69.
- (17) Anderson, J. S.; Gallagher, A. T.; Mason, J. A.; Harris, T. D. “A Five-Coordinate Heme Dioxygen Adduct Isolated within a Metal-Organic Framework” *J. Am. Chem. Soc.* **2014**, *136*, 16489–16492.
- (16) Queen, W. L.; Hudson, M. R.; Bloch, E. D.; Mason, J. A.; Gonzalez, M.; Lee, J. S.; Gygi, D.; Howe, J. D.; Lee, K.; Darwish, T. A.; James, M.; Peterson, V. K.; Teat, S. J.; Smit, B.; Neaton, J. B.; Long, J. R.; Brown, C. M. “Comprehensive Study of Carbon Dioxide Adsorption in the Metal-Organic Frameworks M<sub>2</sub>(dobdc) (M = Mg, Mn, Fe, Co, Ni, Cu, Zn)” *Chem. Sci.* **2014**, *5*, 4569–4581.
- (15) Kapelewski, M. T.; Geier, S. J.; Hudson, M. R.; Stück, D.; Mason, J. A.; Nelson, J. N.; Xiao, D. J.; Hulvey, Z.; Gilmour, E.; FitzGerald, S. A.; Head-Gordon, M.; Brown, C. M.; Long, J. R. “M<sub>2</sub>(m-dobdc) (M = Mg, Mn, Fe, Co, Ni) Metal-Organic Frameworks Exhibiting Increased Charge Density and Enhanced H<sub>2</sub> Binding at the Open Metal Sites” *J. Am. Chem. Soc.* **2014**, *136*, 10752–10761.
- (14) Bloch, E. D.; Hudson, M. R.; Mason, J. A.; Chavan, S.; Crocellà, V.; Howe, J. D.; Lee, K.; Dzubak, A. L.; Queen, W. L.; Zadrozny, J. M.; Geier, S. J.; Lin, L.-C.; Gagliardi, L.; Smit, B.; Neaton, J. B.; Bordiga, S.; Brown, C. M.; Long, J. R. “Reversible CO Binding Enables Tunable CO/H<sub>2</sub> and CO/N<sub>2</sub> Separations in Metal-Organic Frameworks with Exposed Divalent Metal Cations” *J. Am. Chem. Soc.* **2014**, *136*, 10752–10761.
- (13) Xiao, D. J.; Bloch, E. D.; Mason, J. A.; Queen, W. L.; Hudson, M. R.; Planas, N.; Borycz, J.; Dzubak, A. L.; Verma, P.; Lee, K.; Bonino, F.; Crocellà, V.; Yano, J.; Bordiga, S.; Truhlar, D. G.; Gagliardi, L.; Brown, C. M.; Long, J. R. “Oxidation of Ethane to Ethanol by N<sub>2</sub>O in a Metal-Organic Framework with Coordinatively Unsaturated Iron(II) Sites” *Nat. Chem.* **2014**, *6*, 590–595.
- (12) Mason, J. A.; Veenstra, M.; Long, J. R. “Evaluating Metal-Organic Frameworks for Natural Gas Storage” *Chem. Sci.* **2014**, *5*, 32–51.
- (11) FitzGerald, S. A.; Pierce, C. J.; Rowsell, J. L. C.; Bloch, E. D.; Mason, J. A. “Highly Selective Quantum Sieving of D<sub>2</sub> from H<sub>2</sub> by a Metal-Organic Framework as Determined by Gas Manometry and Infrared Spectroscopy” *J. Am. Chem. Soc.* **2013**, *135*, 9458–9464.

- (10) Herm, Z. R.; Wiers, B. M.; Mason, J. A.; van Baten, J. M.; Hudson, M. R.; Zajdel, P.; Brown, C. M.; Masciocchi, N.; Krishna, R.; Long, J. R. "Separation of Hexane Isomers in a Metal-Organic Framework with Triangular Channels" *Science* **2013**, *340*, 960–964.
- Highlighted by NIST, *MIT Technology Review*
- (9) Das, A.; Choucair, M.; Southon, P. D.; Mason, J. A.; Zhao, M.; Kepert, C. J.; Harris, A. D.; D'Alessandro, D. M. "Application of the Piperazine Grafted CuBTri MetalOrganic Framework in Postcombustion Carbon Dioxide Capture" *Microporous Mesoporous Mater.* **2013**, *174*, 74–80.
- (8) Geier, S. J.; Mason, J. A.; Bloch, E.D.; Queen, W. L.; Hudson, M. R.; Brown, C. M.; Long, J. R. "Selective Adsorption of Ethylene over Ethane and Propylene over Propane in the Metal-Organic Frameworks  $M_2(\text{dobdc})$  ( $M = \text{Mg, Mn, Fe, Co, Ni, Zn}$ )" *Chem. Sci.* **2013**, *4*, 2054–2061.
- (7) Bae, T.-H.; Hudson, M. R.; Mason, J. A.; Queen, W. L.; Dutton, J. J.; Sumida, K.; Micklash, K. J.; Kaye, S. S.; Brown, C. M.; Long, J. R. "Evaluation of CationExchanged Zeolite Adsorbents for Post-Combustion Carbon Dioxide Capture" *Energy Environ. Sci.* **2013**, *6*, 128–138.
- (6) Kong, X.; Scott, E.; Ding, W.; Mason, J. A.; Long, J. R.; Reimer, J. A. "CO<sub>2</sub> Dynamics in a Metal-Organic Framework with Open Metal Sites" *J. Am. Chem. Soc.* **2012**, *134*, 14341–14344.
- (5) McDonald, T. M.; Lee, W. R.; Mason, J. A.; Wiers, B. M.; Hong, C. S.; Long, J. R. "Capture of Carbon Dioxide from Air and Flue Gas in the Alkylamine-Appended Metal-Organic Framework  $\text{mmen-Mg}_2(\text{dobpdc})$ " *J. Am. Chem. Soc.* **2012**, *134*, 7056–7065.
- (4) Queen, W. L.; Bloch, E. D.; Brown, C. M.; Hudson, M. R.; Mason, J. A.; Murray, L. J.; Ramirez-Cuesta, A. J.; Peterson, V. K.; Long, J. R. "Hydrogen Adsorption in the MetalOrganic Frameworks  $\text{Fe}_2(\text{dobdc})$  and  $\text{Fe}_2(\text{O}_2)(\text{dobdc})$ " *Dalton Trans.* **2012**, *41*, 4180–4187.
- (3) Hudson, M. R.; Queen, W. L.; Mason, J. A.; Fickel, D. W.; Lobo, R. F.; Brown, C. M. "Unconventional, Highly Selective CO<sub>2</sub> Adsorption in Zeolite SSZ-13" *J. Am. Chem. Soc.* **2012**, *134*, 1970–1973.
- (2) Sumida, K.; Rogow, D. L.; Mason, J. A.; McDonald, T. M.; Bloch, E. D.; Herm, Z. R.; Bae, T.-H.; Long, J. R. "Carbon Dioxide Capture in Metal-Organic Frameworks" *Chem. Rev.* **2012**, *112*, 724–781.
- (1) Mason, J. A.; Sumida, K.; Herm, Z. R.; Krishna, R.; Long, J. R. "Evaluating MetalOrganic Frameworks for Post-Combustion Carbon Dioxide Capture via Temperature Swing Adsorption" *Energy Environ. Sci.* **2011**, *4*, 3030–3040.

## PATENTS

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- (1) "Adsorbents with Stepped Isotherms for Gas Storage Applications" Long, J. R.; Mason, J. A.; Taylor, M. K.; Oktawiec, J. July 7, 2020, US 10,702,850 B2.