

# **James Fraser STODDART**

## **List of Publications and Patents**

## COMMUNICATIONS, PAPERS AND REVIEWS

1. The analytical importance of the methoxy content of Acacia gum exudates (D.M.W. Anderson, G.M. Cree, M.A. Herbich, K.A. Karamalla, J.F. Stoddart), *Talanta* **1964**, *11*, 1559–1560.
2. An infrared method for the determination of small amounts of acetaldehyde in aqueous solution (D.M.W. Anderson, J.F. Stoddart) in Proceedings of S.A.C. Symposium, Nottingham, ed. P.W. Shallis (Heffer and Sons, Cambridge) 1965, 232–238.
3. The use of Biogel-P in the gel filtration of polysaccharides (D.M.W. Anderson, I.C.M. Dea, S. Rahman, J.F. Stoddart), *Chem. Commun.* **1965**, 145–146. [28]
4. Some observations on molecular weight estimations by molecular-sieve chromatography (D.M.W. Anderson, J.F. Stoddart), *Anal. Chim. Acta* **1966**, *34*, 401–406. [55]
5. The use of molecular-sieve chromatography in studies on Acacia senegal gum (gum arabic) (D.M.W. Anderson, J.F. Stoddart), *Carbohyd. Res.* **1966**, *2*, 104–114.
6. Some structural features of *Acacia senegal* gum (gum arabic) (D.M.W. Anderson, Sir Edmund Hirst, J.F. Stoddart), *J. Chem. Soc. (C)* **1966**, 1959–1966. [63]
7. Theories of molecular-sieve chromatography (D.M.W. Anderson, J.F. Stoddart), *Lab. Practice* **1967**, *16*, 841–846.
8. Some structural features of *Acacia arabica* gum (D.M.W. Anderson, Sir Edmund Hirst, J.F. Stoddart), *J. Chem. Soc. (C)* **1967**, 1476–1486. [40]
9. Analytical Chemistry (D.M.W. Anderson, T.B. Pierce, J.F. Stoddart, J.D. Wilson), *Ann. Reports Chem. Soc.* **1967**, *63*, 657–687. [0]
10. Isolation of two arabinoses from *Acacia nilotica* gum (R.C. Chalk, J.K.N. Jones, J.F. Stoddart, W.A. Szarek), *Canad. J. Chem.* **1968**, *46*, 2311–2313. [5]
11. Medium heterocyclic rings from carbohydrate precursors (J.F. Stoddart, W.A. Szarek), Abstracts of 156th Amer. Chem. Soc. Mtg., Atlantic City, September 1968, CARB 28; *Canad. J. Chem.* **1968**, *46*, 3061–3069. [20]
12. Some structural features of *Citrus limonia* gum (lemon gum) (J.K.N. Jones, J.F. Stoddart), *Carbohyd. Res.* **1968**, *8*, 29–42. [21]
13. Some structural features of the mucilage from the bark of *Ulmus fulva* (slippery elm mucilage) (R.J. Beveridge, J.K.N. Jones, J.F. Stoddart, W.A. Szarek), *Carbohyd. Res.* **1969**, *9*, 429–439. [14]
14. Conformational studies on 1,3-dioxepans. Part I. 1,3:2,5:4,6-Tri-*O*-methylene-D-mannitol and some related compounds (T.B. Grindley, J.F. Stoddart, W.A. Szarek), *J. Chem. Soc. (B)* **1969**, 172–175. [19]
15. Conformational studies on 1,3-dioxepans. Part II. 1,3:2,5:4,6-Tri-*O*-methylene-D-mannitol and some related compounds (T.B. Grindley, J.F. Stoddart, W.A. Szarek), *J. Chem. Soc. (B)* **1969**, 623–626. [12]
16. Isochronous and anisochronous *O*-methylene protons in 4,5:9,10-bis-cyclo-hexano-1,3,6,8-tetraoxacyclodecanes (T.B. Grindley, J.F. Stoddart, W.A. Szarek), 52nd Chemical Institute of Canada Conference in Montreal, May 1969; *J. Am. Chem. Soc.* **1969**, *91*, 4722–4724. [13]
17. Large heterocyclic rings from carbohydrate precursors (J.K.N. Jones, J.F. Stoddart, W.A. Szarek), *Canad. J. Chem.* **1969**, *47*, 3213–3215. [9]
18. Conformational studies on 1,3-dioxepans. Part III. 1,6-Dideoxy-2,5-*O*-methylene-D-mannitol and some related compounds (J.F. Stoddart, W.A. Szarek), Abstracts of 158th Amer. Chem. Soc. Meeting, New York, 1969, CARB 24; *J. Chem. Soc. (B)* **1971**, 437–442. [18]
19. Stereochemistry (J.F. Stoddart), *Chem. Br.* **1971**, *9*, 250. [2]
20. Stereochemistry at Sheffield (J.F. Stoddart), *Chem. Br.* **1972**, *10*, 216. [1]
21. Stereochemistry (J.F. Stoddart) in MTP International Review of Science, Organic Chemistry, Series One, Volume 1, ed. W.D. Ollis (1973), 1–28.
22. Molecular structure and conformations of carbohydrates (J.F. Stoddart) in MTP International Review of Science, Organic Chemistry, Series One, Volume 7, ed. G.O. Aspinall, 1973, 1–30.
23. Stereochemistry at Sheffield (J.F. Stoddart), *Chem. Br.* **1973**, *11*, 362–363. [1]

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26. Synthesis of medium heterocyclic rings from 6-deoxy-D-allose (R.G.S. Ritchie, J.F. Stoddart, W.A. Szarek, D.M. Vyas), *Carbohyd. Res.* **1974**, *32*, 279–285. [8]
27. Stereospecific synthesis of the *trans-anti-trans*- and *trans-syn-trans*-isomers of dicyclohexyl-18-crown-6 (J.F. Stoddart, C.M. Wheatley), *J. Chem. Soc., Chem. Commun.* **1974**, 390–391. [22]
28. The conformational behaviour of some medium-sized ring systems (W.D. Ollis, J.F. Stoddart, I.O. Sutherland), *Tetrahedron* **1974**, *30*, 1903–1921. [60]
29. Synthesis of macrobicyclic polyethers with carbon bridgeheads (A.C. Coxon, J.F. Stoddart), *J. Chem. Soc., Chem. Commun.* **1974**, 537. [14]
30. Constitutional isomerism in bicyclic diacetals and the conformational behaviour of *cis*-fused 1,3,6,8-tetraoxabicyclo[5,3,0]decanes (I.J. Burden, J.F. Stoddart), *J. Chem. Soc., Chem. Commun.* **1974**, 863–864. [7]
31. Configurational equilibria in 2,4-disubstituted- $\gamma$ -butyrolactones (S.A.M.T. Hussain, W.D. Ollis, C. Smith, J.F. Stoddart), *J. Chem. Soc., Chem. Commun.* **1974**, 873–874. [2]
32. Conformational studies on aza and thia derivatives of 12,13-dihydro-11*H*-dibenzo[*a,e*]cyclononene (W.D. Ollis, J.F. Stoddart), *Angew. Chem., Int. Ed. Engl.* **1974**, *13*, 727–729. [3]
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34. Conformational studies on oxa, thia, and aza derivatives of 7,8,13,14-tetrahydro-benzo[1,2]cyclonona[5,6,7-*de*]naphthalene and 8*H*,15*H*-7,16-dioxacyclodeca-[1,2,3-*de*:6,7,8-*d'e*] dinaphthalene (D.J. Brickwood, W.D. Ollis, J.F. Stoddart), *Angew. Chem., Int. Ed. Engl.* **1974**, *13*, 731–732. [2]
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36. The synthesis and conformational behaviour of *N,N',N''*-trimethyltrianthranilide (W.D. Ollis, J.A. Price, J.S. Stephanatou, J.F. Stoddart), *Angew. Chem., Int. Ed. Engl.* **1975**, *14*, 169. [18]
37. Isomerism in bicyclic diacetals. Part I. 1,3:2,4- and 1,4:2,3-di-*O*-methylene-erythritol (I.J. Burden, J.F. Stoddart), *J. Chem. Soc., Perkin Trans. 1* **1975**, 666–674. [24]
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43. Stereochemistry in Sheffield (J.F. Stoddart), *Chem. Br.* **1975**, *13*, 369.
44. The use of symmetry and carbohydrates in the design of cryptands (W.D. Curtis, D.A. Laidler, J.F. Stoddart), Abstracts of Centennial Amer. Chem. Soc. Mtg., New York, April 1976, CARB 54.
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Issue date: 2016-03-22. Patent number 9,290,495
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Issue date: 2016-07-26. Patent number 9,399,803
14. Supramolecular networks with electron transfer in two dimensions (A. Narayanan, A. Shveyd, J.F. Stoddart, S. Stupp, C.H. Sue, A. Tayi)  
Issue date: 2016-09-13. Patent number 9,443,636
15. Modular supramolecular approach for co-crystallization of donors and acceptors into ordered networks (A. Narayanan, A. Shveyd, J.F. Stoddart, S. Stupp, C. H. Sue, A. Tayi)  
Issue date: 2016-09-20. Patent number 9,449,731
16. Redox active triangular organic materials (M. Frasconi, Z. Liu, S. Schneebeli, J.F. Stoddart)  
Issue date: 2017-01-17. Patent number 9,546,169
17. A homochiral metal-organic framework with enantiopure pillar[5]arene active domains (J.F. Stoddart, N.L. Strutt)  
Issue date: 2017-11-14. Patent number 9,815,764
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Issue date: 2017-11-28. Patent number 9,828,371
20. Supramolecular networks with electron transfer in two dimensions (A. Narayanan, A. Shveyd, J.F. Stoddart, S. Stupp, C.H. Sue, A. Tayi)  
Issue date: 2018-06-12. Patent number 9,997,271
21. Modular supramolecular approach for co-crystallization of donors and acceptors into ordered networks (A. Narayanan, A. Shveyd, J.F. Stoddart, S. Stupp, C.H. Sue, A. Tayi)  
Issue date: 2018-06-12. Patent number 9,997,272

22. Nanoporous carbohydrate frameworks and the sequestration and detection of molecules using the same (R.S. Forgan, J.J. Gassensmith, R.A. Smaldone, J.F. Stoddart)  
Issue date: 2018-11-13. Patent number 10,125,016
23. Electrochemical detection of carbon dioxide using a carbohydrate based coordination polymer (O. Farha, J. Gassensmith, N. Jeong, J.F. Stoddart)  
Issue date: 2019-03-12. Patent number 10,228,343
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Issue date: 2019-03-26. Patent number 10,239,044
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Issue date: 2019-04-16. Patent number 10,259,913

### PROVISIONAL PATENT APPLICATIONS

1. **Serial No.:** 61/314,889  
**Inventors:** J. F. Stoddart, A. M. Z. Slawin, R. S. Forgan, R. A. Smaldone  
**Filing Date:** 2010-03-17  
**Title:** Nanoporous carbohydrate frameworks
2. **Serial No.:** 61/351,704  
**Inventors:** J. F. Stoddart, J. J. Gassensmith, R. S. Forgan, R. A. Smaldone  
**Filing Date:** 2010-06-04  
**Title:** Sequestration and detection of carbon dioxide by a metal organic framework
3. **Serial No.:** 61/314,897  
**Inventors:** J. F. Stoddart, C.-H. Sue, S. Basu  
**Filing Date:** 201-03-17  
**Title:** A novel purification of CBPQT<sup>4+</sup> macrocycle
4. **Serial No.:** 61/488,605  
**Inventors:** S. I. Stupp, J. F. Stoddart, A. K. Shveyd, A. S. Tayi, C.-H. Sue  
**Filing Date:** 2011-05-20  
**Title:** Lock-arm supramolecular ordering
5. **Serial No.:** 61/498,262  
**Inventors:** S. I. Stupp, J. F. Stoddart, A. K. Shveyd, A. S. Tayi, C.-H. Sue  
**Filing Date:** 2011-06-17  
**Title:** Visible pleochroism in a supramolecular material
6. **Serial No.:** 61/498,277  
**Inventors:** S. I. Stupp, J. F. Stoddart, A. K. Shveyd, A. S. Tayi, C.-H. Sue  
**Filing Date:** 2011-06-17  
**Title:** Supramolecular design for ferroelectric charge crystals
7. **Serial No.:** 61/537,852  
**Inventors:** J. F. Stoddart, A. C. Fahrenbach, J. C. Barnes, S. Sampath, A. N. Basuray, H. Li  
**Filing Date:** 2011-09-22  
**Title:** Crystalline bipyridinium radical complexes and uses thereof
8. **Serial No.:** 61/550,748  
**Inventors:** J. F. Stoddart, S. Grunder, A. C. Whalley, C. Valente  
**Filing Date:** 2011-10-24  
**Title:** Molecular gauge blocks for building on the nanoscale



9. **Serial No.:** 61/740,958  
**Inventors:** J. F. Stoddart, J. C. Barnes, M. Juríček  
**Filing Date:** 2012-12-21  
**Title:** Tetracationic cyclophanes and their use in the sequestration of polyaromatic hydrocarbons by way of complexation
10. **Serial No.:** 61/814,066  
**Inventors:** J. F. Stoddart, Z. Liu, M. Frasconi, D. Cao  
**Filing Date:** 2013-04-19  
**Title:** Compounds and methods to isolate gold
11. **Serial No.:** 61/883,352  
**Inventors:** J. F. Stoddart, S. Sampath, A. N. Basuray, K. J. Hartlieb, H.-P. Jaquot de Rouville  
**Filing Date:** 2013-09-27  
**Title:** Methods of making diazaperopyrenium dications and uses thereof
12. **Serial No.:** 62/008,671  
**Inventors:** K. Hartlieb, J. Holcroft, J.F. Stoddart  
**Filing Date:** 2014-06-06  
**Title:** Carbohydrate-mediated purification of petrochemicals
13. **Serial No.:** 62/045,517  
**Inventors:** O. K. Farha, J. J. Gassensmith, J. F. Stoddart, N. C. Jeong  
**Filing Date:** 2014-09-03  
**Title:** Electrochemical detection of carbon dioxide using a carbohydrate based coordination polymer
14. **Serial No.:** 62/045,531  
**Inventors:** J. F. Stoddart, M. Frasconi, S. T. Schneebeli, Z. Liu  
**Filing Date:** 2014-09-03  
**Title:** Redox active triangular organic materials
15. **Serial No.:** 62/045,511  
**Inventors:** J. F. Stoddart, J. C. Barnes, M. Juríček, E. J. Dale, N. A. Vermeulen  
**Filing Date:** 2014-09-03  
**Title:** ExCage: Synthesis of viologen-like pyridinium-based cages for the selective capture of polycyclic aromatic hydrocarbons
16. **Serial No.:** 62/045,514  
**Inventors:** J. F. Stoddart, N. L. Strutt  
**Disclosure Date:** 2014-09-03  
**Title:** A homochiral metal-organic framework with enantiopure pillar[5] arene active domains
17. **Serial No.:** 62/057,059  
**Inventors:** J. F. Stoddart, X. Hou, C. Ke  
**Filing Date:** 2014-09-29  
**Title:** Supramolecular encrypted fluorescent security ink compositions
18. **Serial No.:** 62/057,102  
**Inventors:** J. F. Stoddart, X. Hou, C. Ke, R. B. Pettman  
**Filing Date:** 2014-09-29  
**Title:** Supramolecular encrypted fluorescent security ink compositions
19. **Serial No.:** 62/135,339  
**Inventors:** J. F. Stoddart, D. Chen, A.-J. Avestro, J. Sun, Z. B. Erno

- Filing Date:** 2015-03-19  
**Title:** Rigid naphthalenediimide triangle structures
20. **Serial No.:** 62/255,490  
**Inventors:** D. Ferris, K. Hartlieb, J. Holcroft, J.F. Stoddart  
**Filing Date:** 2015-11-15  
**Title:** Uptake of pharmaceuticals within cyclodextrin-based porous materials
21. **Serial No.:** 62/278,200  
**Inventors:** Z. Liu, J.F. Stoddart  
**Filing Date:** 2016-01-13  
**Title:** Supramolecular assembly of rigid macrocycles through cooperative hydrogen bond interactions
22. **Serial No.:** 62/288,701  
**Inventors:** M. Frascioni, J.F. Stoddart, J. Sun, Y. Wang  
**Filing Date:** 2016-01-29  
**Title:** Viologen-based rotaxanes
23. **Serial No.:** 62/308,998  
**Inventors:** Z. Liu, S. Nalluri, J.F. Stoddart  
**Filing Date:** 2016-03-16  
**Title:** Rigid chiral redox-active isosceles triangles
24. **Serial No.:** 62/321,290  
**Inventors:** V. Dravid, D. Ferris, K.A. Hujsak, M. Owczarek, A. Prokofjevs, J.F. Stoddart  
**Filing Date:** 2016-04-12  
**Title:** Flexible piezoelectric and antiferroelectric haloimidazole crystals
25. **Serial No.:** 62/382,994  
**Inventors:** V. Dravid, D. Ferris, D. Hong, K.A. Hujsak, M. Owczarek, A. Prokofjevs, J.F. Stoddart  
**Filing Date:** 2016-09-02  
**Title:** Flexible piezoelectric and antiferroelectric haloimidazole crystals
26. **Serial No.:** 62/416,334  
**Inventors:** D. Ferris, K. Hartlieb, J. Holcroft, J.F. Stoddart  
**Filing Date:** 2016-11-02  
**Title:** Loading and bioavailability of ibuprofen/CD-MOF formulations
27. **Serial No.:** 62/531,115  
**Inventors:** Z. Liu, J.F. Stoddart, J. Sun  
**Filing Date:** 2017-07-11  
**Title:** Mechanically interlocked air-stable radicals
28. **Serial No.:** 62/535,579  
**Inventors:** Z. Liu, S. Nalluri, H. Patel, J.F. Stoddart  
**Filing Date:** 2017-07-21  
**Title:** Lithiated cyclodextrin metal organic frameworks and methods of making and using the same
29. **Serial No.:** 62/580,860  
**Inventors:** H. Patel, J.F. Stoddart  
**Filing Date:** 2017-11-02  
**Title:** Troger's base-linked poly(crown ether)s
30. **Serial No.:** 62/619,561  
**Inventors:** S. Nalluri, J.F. Stoddart

**Filing Date:** 2018-01-19  
**Title:** Rigid chiral photoluminescent isocetes triangular materials

31. **Serial No.:** 62/653,301  
**Inventors:** M. Nguyen, J.F. Stoddart  
**Filing Date:** 2018-04-05  
**Title:** Densely charged catenanes
32. **Serial No.:** 62/658,048  
**Inventors:** I. Roy, J.F. Stoddart  
**Filing Date:** 2018-04-16  
**Title:** Cyclophanes for live-cell imaging
33. **Serial No.:** 62/680,352  
**Inventors:** Z. Liu, J.F. Stoddart  
**Filing Date:** 2018-06-04  
**Title:** Mixed-valence crystal superstructures
34. **Serial No.:** 62/691,923  
**Inventors:** M. Nguyen, J.F. Stoddart  
**Filing Date:** 2018-06-29  
**Title:** Densely Charged Catenanes
35. **Serial No.:** 62/700,614  
**Inventors:** J. Choi, D.J. Kim, J.F. Stoddart, D.-J. Yoo  
**Filing Date:** 2018-07-19  
**Title:** Rechargeable Aluminum Organic Batteries
36. **Serial No.:** 62/799,229  
**Inventors:** I. Roy, J.F. Stoddart  
**Filing Date:** 2019-01-31  
**Title:** Supramolecular Photoprotection of a Photosensitizer for Safe Lysosomal Delivery and Anticancer Therapy

#### PENDING US PATENT APPLICATIONS

1. **Serial No.:** 13/658,973  
**Inventors:** J. F. Stoddart, S. Grunder, A. C. Whalley, C. Valente  
**Filing Date:** 2012-10-24  
**Title:** Molecular gauge blocks for building on the nanoscale
2. **Serial No.:** 14/733,875  
**Inventors:** J. F. Stoddart, K. J. Hartlieb, J. M. Holcroft  
**Filing Date:** 2015-06-08  
**Title:** Carbohydrate-mediated purification of petrochemicals
3. **Serial No.:** 14/867,826  
**Inventors:** X. Hou, C. Ke, J.F. Stoddart  
**Filing Date:** 2015-09-28  
**Title:** Supramolecular fluorescent dyes
4. **Serial No.:** 14/867,953  
**Inventors:** X. Hou, C. Ke, J.F. Stoddart  
**Filing Date:** 2015-09-28  
**Title:** Supramolecular encrypted fluorescent security ink compositions

5. **Serial No.:** 15/074,161  
**Inventors:** A.-J. Avestro, D. Chen, Z. Erno, J.F. Stoddart, J. Sun  
**Filing Date:** 2016-03-18  
**Title:** Rigid naphthalenediimide triangle structures
6. **Serial No.:** 15/218,280  
**Inventors:** D. Cao, M. Frascioni, Z. Liu, J.F. Stoddart  
**Filing Date:** 2016-07-25  
**Title:** Compounds and methods to isolate gold
7. **Serial No.:** 15/350,975  
**Inventors:** D. Ferris, K. Hartlieb, J. Holcroft, J.F. Stoddart  
**Filing Date:** 2016-11-14  
**Title:** Uptake of pharmaceuticals within cyclodextrin-based porous materials
8. **Serial No.:** 16/032,212  
**Inventors:** Z. Liu, J.F. Stoddart, J. Sun  
**Filing Date:** 2018-07-11  
**Title:** Mechanically interlocked air-stable radicals
9. **Serial No.:** 16/069,940  
**Inventors:** Z. Liu, J.F. Stoddart  
**Filing Date:** 2018-07-13  
**Title:** Supramolecular assembly of rigid macrocycles through cooperative hydrogen bond interactions
10. **Serial No.:** 16/085,436  
**Inventors:** Z. Liu, S. Nalluri, J.F. Stoddart  
**Filing Date:** 2018-09-14  
**Title:** Rigid chiral redox-active isocenes triangular materials
11. **Serial No.:** 16/093,256  
**Inventors:** V. Dravid, D. Ferris, D. Hong, K.A. Hujsak, M. Owczarek, A. Prokofjevs, J.F. Stoddart  
**Filing Date:** 2018-10-12  
**Title:** Flexible piezoelectric and antiferroelectric haloimidazole crystals
12. **Serial No.:** 16/269,311  
**Inventors:** X. Hou, C. Ke, R. Pettman, J.F. Stoddart  
**Filing Date:** 2019-02-06  
**Title:** Supramolecular encrypted fluorescent security ink compositions

#### PCT APPLICATIONS

1. **Serial No.:** PCT/US2011/028866  
**Inventors:** J. J. Gassensmith, R. A. Smaldone, R. S. Forgan, J. F. Stoddart  
**Filing Date:** 2011-03-17  
**Title:** Nanoporous carbohydrate frameworks and the sequestration and detection of molecules using the same
2. **Serial No.:** PCT/US2012/038896  
**Inventors:** S. I. Stupp, J. F. Stoddart, A. K. Shveyd, A. S. Tayi, C.-H. Sue  
**Filing Date:** 2012-05-21  
**Title:** Modular supramolecular approach for co-crystallization of donors and acceptors into ordered networks
3. **Serial No.:** PCT/US2012/042978  
**Inventors:** S. I. Stupp, J. F. Stoddart, A. K. Shveyd, A. S. Tayi, C.-H. Sue

- Filing Date:** 2012-06-18  
**Title:** Visible pleochroism in a supramolecular material
4. **Serial No.:** PCT/US2013/077144  
**Inventors:** J. F. Stoddart, J. C. Barnes, M. Juríček  
**Filing Date:** 2013-12-20  
**Title:** Tetracationic cyclophanes and their use in the sequestration of polyaromatic hydrocarbons by way of complexation
  5. **Serial No.:** PCT/US2014/034697  
**Inventors:** J. F. Stoddart, Z. Liu, M. Frasconi, D. Cao  
**Filing Date:** 2014-04-18  
**Title:** Compounds and methods to isolate gold
  6. **Serial No.:** PCT/US2015/034754  
**Inventors:** J. F. Stoddart, K. J. Hartlieb, J. M. Holcroft  
**Filing Date:** 2015-06-08  
**Title:** Carbohydrate-mediated purification of petrochemicals
  7. **Serial No.:** PCT/US2015/052670  
**Inventors:** X. Hou, C. Ke, J.F. Stoddart  
**Filing Date:** 2015-09-28  
**Title:** Supramolecular fluorescent dyes
  8. **Serial No.:** PCT/US2015/052694  
**Inventors:** X. Hou, C. Ke, R. Pettman, J.F. Stoddart  
**Filing Date:** 2015-09-28  
**Title:** Supramolecular encrypted fluorescent security ink compositions
  9. **Serial No.:** PCT/US2016/023111  
**Inventors:** A.-J. Avestro, D. Chen, Z. Erno, J.F. Stoddart, J. Sun  
**Filing Date:** 2016-03-16  
**Title:** Rigid naphthalenediimide triangle structures
  10. **Serial No.:** PCT/US2016/061963  
**Inventors:** D. Ferris, K. Hartlieb, J. Holcroft, J.F. Stoddart  
**Filing Date:** 2016-11-15  
**Title:** Uptake of pharmaceuticals within cyclodextrin-based porous materials
  11. **Serial No.:** PCT/US2017/013301  
**Inventors:** Z. Liu, J.F. Stoddart  
**Filing Date:** 2017-01-13  
**Title:** Supramolecular assembly of rigid macrocycles through cooperative hydrogen bond interactions
  12. **Serial No.:** PCT/US2017/015299  
**Inventors:** M. Frasconi, J.F. Stoddart, J. Sun, Y. Wang  
**Filing Date:** 2017-01-27  
**Title:** Viologen-based rotaxanes
  13. **Serial No.:** PCT/US2017/022668  
**Inventors:** Z. Liu, S. Nalluri, J.F. Stoddart  
**Filing Date:** 2017-03-16  
**Title:** Rigid chiral redox-active isocetes triangular materials

14. **Serial No.:** PCT/US2017/027170  
**Inventors:** V. Dravid, D. Ferris, D. Hong, K.A. Hujsak, M. Owczarek, A. Prokofjevs, J.F. Stoddart  
**Filing Date:** 2017-04-12  
**Title:** Flexible piezoelectric and antiferroelectric haloimidazole crystals
15. **Serial No.:** PCT/US2018/041551  
**Inventors:** Z. Liu, J.F. Stoddart, J. Sun  
**Filing Date:** 2018-07-11  
**Title:** Mechanically interlocked air-stable radicals
16. **Serial No.:** PCT/US2018/043217  
**Inventors:** Z. Liu, S. Nalluri, H. Patel, J.F. Stoddart  
**Filing Date:** 2018-07-23  
**Title:** Lithiated cyclodextrin metal organic frameworks and methods of making and using the same
17. **Serial No.:** PCT/US2018/059046  
**Inventors:** H. Patel, J.F. Stoddart  
**Filing Date:** 2018-11-02  
**Title:** Troger's base-linked poly(crown ether)s
18. **Serial No.:** PCT/US2019/014415  
**Inventors:** S. Nalluri, J.F. Stoddart  
**Filing Date:** 2019-01-21  
**Title:** Rigid chiral photoluminescent isosceles triangular materials
19. **Serial No.:** PCT/US2019/026095  
**Inventors:** M. Nguyen, J.F. Stoddart  
**Filing Date:** 2019-04-05  
**Title:** Densely charged catenanes
20. **Serial No.:** PCT/US2019/027713  
**Inventors:** I. Roy, J.F. Stoddart  
**Filing Date:** 2019-04-16  
**Title:** Cyclophanes for live-cell imaging

#### ISSUED FOREIGN PATENTS

1. Compounds and Methods to Isolate Gold (D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart).  
Issue date: 2018-10-11. Country: Australia Patent number: 2014253728.
2. Carbohydrate-Mediated Purification of Petrochemicals (K. Hartlieb, J. Holcroft, J.F. Stoddart).  
Issue date: 2018-11-07. Country: EPO Patent number: EP 3077104.
3. Compounds and Methods to Isolate Gold (D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart).  
Issue date: 2019-04-03. Country: Armenia Patent number: EUR 024977.
4. Compounds and Methods to Isolate Gold (D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart).  
Issue date: 2019-04-03. Country: Azerbaijan Patent number: EUR 024977.
5. Compounds and Methods to Isolate Gold (D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart).  
Issue date: 2019-04-03. Country: Belarus Patent number: EUR 024977.
6. Compounds and Methods to Isolate Gold (D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart).  
Issue date: 2019-04-03. Country: Kazakhstan Patent number: EUR 024977.
7. Compounds and Methods to Isolate Gold (D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart).  
Issue date: 2019-04-03. Country: Kyrgyzstan Patent number: EUR 024977.

8. Compounds and Methods to Isolate Gold (D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart). Issue date: 2019-04-03. Country: Russia Patent number: EUR 024977.
9. Compounds and Methods to Isolate Gold (D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart). Issue date: 2019-04-03. Country: Tajikistan Patent number: EUR 024977.
10. Compounds and Methods to Isolate Gold (D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart). Issue date: 2019-04-03. Country: Turkmenistan Patent number: EUR 024977.
11. Compounds and Methods to Isolate Gold (D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart). Issue date: 2019-04-03. Country: Eurasia Patent number: EUR 024977.
12. Tetracationic Cyclophanes and Their Use in the Sequestration of Polyaromatic Hydrocarbons by Way of Complexation (J. Barnes, M. Juricek, J.F. Stoddart). Issue date: 2016-08-28. Country: Saudi Arabia Patent number: SA 5024.

#### PENDING FOREIGN PATENT APPLICATIONS

1. **Serial No.:** EP 13866011.3  
**Country:** EPO  
**Inventors:** J. F. Stoddart, J. C. Barnes, M. Juríček  
**Filing Date:** 2015-06-24  
**Title:** Tetracationic cyclophanes and their use in the sequestration of polyaromatic hydrocarbons by way of complexation
2. **Serial No.:** CA 2,909,203  
**Country:** Canada  
**Inventors:** D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart  
**Filing Date:** 2015-10-08  
**Title:** Compounds and Methods to Isolate Gold
3. **Serial No.:** PH 1-2015-502366  
**Country:** Philippines  
**Inventors:** D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart  
**Filing Date:** 2015-10-02  
**Title:** Compounds and Methods to Isolate Gold
4. **Serial No.:** PERU 002159-2015/DIN  
**Country:** Peru  
**Inventors:** D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart  
**Filing Date:** 2015-10-15  
**Title:** Compounds and Methods to Isolate Gold
5. **Serial No.:** CN 201480023847.X  
**Country:** China  
**Inventors:** D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart  
**Filing Date:** 2015-10-27  
**Title:** Compounds and Methods to Isolate Gold
6. **Serial No.:** EP 14785085.3  
**Country:** EPO  
**Inventors:** D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart  
**Filing Date:** 2015-11-04  
**Title:** Compounds and Methods to Isolate Gold
7. **Serial No.:** UZ IAP20150425  
**Country:** Uzbekistan

- Inventors:** D. Cao, M. Frasconi, Z. Liu, J.F. Stoddart  
**Filing Date:** 2015-11-04  
**Title:** Compounds and Methods to Isolate Gold
8. **Serial No.:** CN 201780025678.7  
**Country:** China  
**Inventors:** Z. Liu, S. Nalluri, J.F. Stoddart  
**Filing Date:** 2017-03-16  
**Title:** Rigid Chiral Redox-Active Isosceles Triangular Materials
9. **Serial No.:** SA 517382329  
**Country:** Saudi Arabia  
**Inventors:** A.-J. Avestro, D. Chen, Z. Erno, J.F. Stoddart, J. Sun  
**Filing Date:** 2017-09-17  
**Title:** Rigid Naphthalenediimide Triangle Structures
10. **Serial No.:** ARAB EMIRATES P60011  
**Country:** Arab Emirates  
**Inventors:** A.-J. Avestro, D. Chen, Z. Erno, J.F. Stoddart, J. Sun  
**Filing Date:** 2017-09-19  
**Title:** Rigid Naphthalenediimide Triangle Structures
11. **Serial No.:** EP16765820.2  
**Country:** EPO  
**Inventors:** A.-J. Avestro, D. Chen, Z. Erno, J.F. Stoddart, J. Sun  
**Filing Date:** 2017-10-27  
**Title:** Rigid Naphthalenediimide Triangle Structures
12. **Serial No.:** CN 201680028163.8  
**Country:** China  
**Inventors:** A.-J. Avestro, D. Chen, Z. Erno, J.F. Stoddart, J. Sun  
**Filing Date:** 2017-11-15  
**Title:** Rigid Naphthalenediimide Triangle Structures
13. **Serial No.:** SA 518392119  
**Country:** Saudi Arabia  
**Inventors:** D. Ferris, K. Hartlieb, J. Holcroft, J.F. Stoddart  
**Filing Date:** 2018-07-31  
**Title:** Uptake of Pharmaceuticals within Cyclodextrin-based Porous Materials
14. **Serial No.:** CN 201780015076.3  
**Country:** China  
**Inventors:** M. Frasconi, J.F. Stoddart, J. Sun, Y. Wang  
**Filing Date:** 2018-09-04  
**Title:** Viologen-Based Rotaxanes
15. **Serial No.:** SA 518400208  
**Country:** Saudi Arabia  
**Inventors:** V. Dravid, D. Ferris, D. Hong, K.A. Hujsak, M. Owczarek, A. Prokofjevs, J.F. Stoddart  
**Filing Date:** 2018-10-10  
**Title:** Flexible Piezoelectric and Antiferroelectric Haloimidazole Crystals
16. **Serial No.:** SA 518400208  
**Country:** Saudi Arabia  
**Inventors:** V. Dravid, D. Ferris, D. Hong, K.A. Hujsak, M. Owczarek, A. Prokofjevs, J.F. Stoddart



- Filing Date:** 2018-10-10  
**Title:** Flexible Piezoelectric and Antiferroelectric Haloimidazole Crystals
17. **Serial No.:** EP 17783042.9  
**Country:** EPO  
**Inventors:** V. Dravid, D. Ferris, D. Hong, K.A. Hujsak, M. Owczarek, A. Prokofjevs, J.F. Stoddart  
**Filing Date:** 2018-11-12  
**Title:** Flexible Piezoelectric and Antiferroelectric Haloimidazole Crystals
18. **Serial No.:** CN 201780031574.7  
**Country:** China  
**Inventors:** V. Dravid, D. Ferris, D. Hong, K.A. Hujsak, M. Owczarek, A. Prokofjevs, J.F. Stoddart  
**Filing Date:** 2018-11-22  
**Title:** Flexible Piezoelectric and Antiferroelectric Haloimidazole Crystals
19. **Serial No.:** TO BE PROVIDED  
**Country:** China  
**Inventors:** K. Hartlieb, J. Holcroft, J.F. Stoddart  
**Filing Date:** TO BE PROVIDED  
**Title:** Carbohydrate-Mediated Purification of Petrochemicals
20. **Serial No.:** CN201680072938.1  
**Country:** China  
**Inventors:** D. Ferris, K. Hartlieb, J. Holcroft, J.F. Stoddart  
**Filing Date:** TO BE PROVIDED  
**Title:** Uptake of Pharmaceuticals within Cyclodextrin-based Porous Materials
21. **Serial No.:** EP 16865255.0  
**Country:** EPO  
**Inventors:** D. Ferris, K. Hartlieb, J. Holcroft, J.F. Stoddart  
**Filing Date:** TO BE PROVIDED  
**Title:** Uptake of Pharmaceuticals within Cyclodextrin-based Porous Materials
22. **Serial No.:** TO BE ASSIGNED  
**Country:** Saudi Arabia  
**Inventors:** Z. Liu, S. Nalluri, J.F. Stoddart  
**Filing Date:** TO BE PROVIDED  
**Title:** Rigid Chiral Redox-Active Isosceles Triangular Materials