**Christopher J. Arnusch –IKI report**

***Research Activities***

The Arnusch lab aims to positively impact the field of membrane science, water treatment and new materials in two distinct ways: i) by exploring and developing unconventional ways to improve membrane fabrication and modification using various printing techniques and ii) exploring and developing new materials including graphene-based materials.

We have made significant advances this past year especially with a novel material named “laser-induced graphene” (LIG). This material can now be generated on almost all carbon containing substrates. Notably, we discovered how to apply LIG on porous polymer membranes, as well as demonstrated numerous environmental applications. Seen below is the graphical abstract (from REF 34) for our most significant advance where LIG is fabricated on porous UF membranes, and these membranes are used as porous electrodes and display antifouling and antimicrobial action with applied voltage.



***Publications***

40. Luong, D.X.; Yang, K.; Yoon, J.; Singh, S.P.; Wang, T.; Arnusch, C.J.;. Tour, J.M.

Laser-Induced Graphene Composites as Multifunctional Surfaces. *ACS Nano* 2019, *accepted in press*. **DOI:** 10.1021/acsnano.8b09626.

39. Shtreimer Kandiyote, N.; Avisdris, T.; Arnusch,  C. J. \*, Kasher, R.\* Grafted Polymer Coatings Enhance Fouling Inhibition by Antimicrobial Peptide on Reverse Osmosis Membranes. *Langmuir*2019, DOI: 10.1021/acs.langmuir.8b03851.

38. Shtreimer Kandiyote, N.; Mohanraj, G.; Mao, C.; Kasher, R.\*; Arnusch, C. J.\* Synergy on Surfaces: Anti-Biofouling Interfaces using Surface-Attached Antimicrobial Peptides PGLa and Magainin-2. *Langmuir* 2018, 34 (37), 11147-11155.

37. Singh, S. P.; Rathinam, K.; Kasher, R.\*; Arnusch, C. J.\* Hexavalent chromium ion and methyl orange dye uptake via a silk protein sericin-chitosan conjugate. *RSC Advances* 2018, *8*, 27027-27036.

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35. Rathinam, K.; Singh, S. P.; Arnusch, C. J.\*.; Kasher, R,\* An environmentally-friendly chitosan-lysozyme biocomposite for the effective removal of dyes and heavy metals from aqueous solutions, *Carbohydrate Polymers* 2018, *199* (1), 506-515.

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32. Canwei, M.; Gunasekaran M.; Kandiyote, N.; Kasher, R.; Arnusch, C. J.\* UV mediated attachment of short Arginine-Tryptophan antimicrobial peptides on reverse osmosis membrane surfaces inhibit Pseudomonas aeruginosa biofilm *Desalination* 2018, *431*, 73-79.

31. Singh, S. P.; Li, Y.; Zhang, J.; Tour, J. M.\*; Arnusch, C. J.\* Sulfur-doped laser-induced porous graphene derived from polysulfone-class polymers and membranes *ACS Nano* 2018, *12* (1), 289–297.

30. Bernstein, R\*.; Singer, C. E.; Singh, S. P.; Mao, C.; Arnusch, C. J.\* UV initiated surface grafting on polyethersulfone ultrafiltration membranes via ink-jet printing-assisted modification *Journal of Membrane Science* 2018, *548,*73-80.
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29. Rathinam, K.; Singh, S. P.; Li, Y.; Kasher, R.; Tour, J. M.\*; Arnusch, C. J.\* Polyimide derived laser-induced graphene as adsorbent for cationic and anionic dyes *Carbon* 2017, 124, 515-524.

28. Singh, S. P.; Li, Y.; Be’er A.; Oren, Y.; Tour, J. M.\*; Arnusch, C. J.\* Laser-Induced Graphene Layers and Electrodes Prevents Microbial Fouling and Exerts Antimicrobial Action *ACS Applied Materials and Interfaces* 2017, *9* (21), 18238-18247.

27. Li, Y.; Luong, D.X.; Zhang, J.; Tarkunde, Y. R.; Kittrell, C.; Sargunaraj, F.; Ji, Y.; Arnusch, C. J.\*; and Tour, J. M.\* Laser-Induced Graphene in Controlled Atmospheres. From Superhydrophilic to Superhydrophobic Surfaces. *Advanced Materials*, 2017, 1700496.