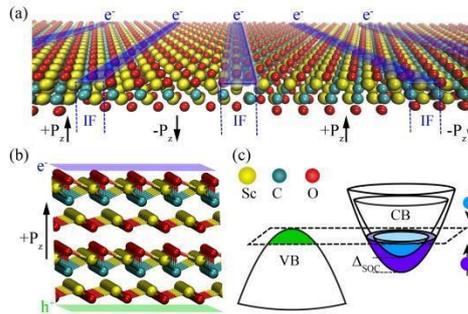


1. Abhishek Kumar Singh (MRC)



The study reported the highest ever out of plane polarisation and simultaneous existence of 2D electron and hole gas in Sc₂CO₂ MXene, which could accelerate the design of nanoelectronic devices. The figure shows (a) One-dimensional metallic interface (shaded blue area labelled IF) in Sc₂CO₂ MXene separating (+P_z) and (-P_z) polarized domains. (b) Bilayer Sc₂CO₂ MXene, the direction of the out-of-plane polarization is shown by the black arrow (c) electron-hole gap formation in the conduction band (CB) valence band (VB), respectively.

Reference: A Chandrasekaran, A Mishra, and **AK Singh** (2017) Ferroelectricity, Antiferroelectricity, and Ultrathin 2D Electron/Hole Gas in Multifunctional Monolayer MXene. *Nano Lett.* 17: 3290–3296

2. Anshu Pandey (SSCU)



Copper-iron sulphide (CuFeS_2) is one of the few solution-processable semiconductors that has both a benign composition and a near-infrared band gap. This work attempts to explain the many peculiar properties of CuFeS_2 , most notably its uncanny resemblance to gold. The photograph shows the reflection of one rupee coin on a high-quality one square-inch solution processed film of CuFeS_2 nanocrystals.

Reference: S Anumol, B Bhattacharyya, VVR Kishore, A Kumar, GP Rajasekar, DD Sarma, and **A Pandey** (2018) Why Does CuFeS_2 Resemble Gold? *J. Phys. Chem. Lett.* 9: 696-701. DOI: 10.1021/acs.jpcllett.7b03190

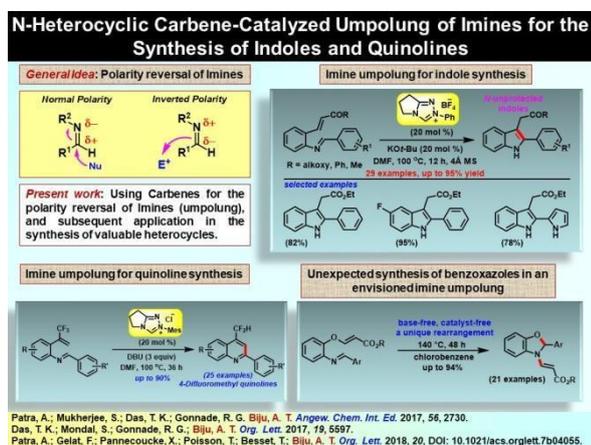
3. Arunan E (IPC)



Arunan's group used a home-built spectrometer (left) to prove that HS dimer is hydrogen bonded (top right) though the solid H_2S is bound by 'Van der Waals interaction' (bottom right). This confirms the new definition of hydrogen bond proposed by an IUPAC task group chaired by him in 2011.

Reference: E Arunan (2017) Plenary Talk given at the 22nd Horizons in Hydrogen Bond Research Conference held in Finland, September 2017.

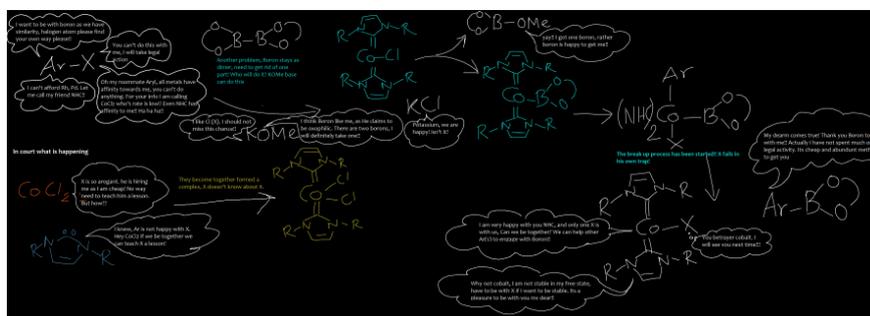
4. Akkattu T Biju (OC)



Imines are electrophilic reagents in organic synthesis. The researchers observed that the inherent electrophilicity of imines can be inverted by using N-heterocyclic carbenes (NHC) as catalysts. Based on this concept, they have uncovered the NHC-catalysed umpolung (polarity inversion) of imines for the synthesis of biologically important functionalised indoles. They also extended the imine umpolung concept to the synthesis of difluoromethylated quinolines. Notably, they synthesised benzoxazoles by attempting imine umpolung on a vinylogous carbonate under hot conditions in the absence of NHC.

Reference: A Patra A, F Gelat, X Pannecoucke, T Poisson, T Besset, and **AT Biju** (2018) Synthesis of 4-Difluoromethylquinolines by NHC-Catalyzed Umpolung of Imines. *Org. Lett.* In Press. DOI: 10.1021/acs.orglett.7b04055

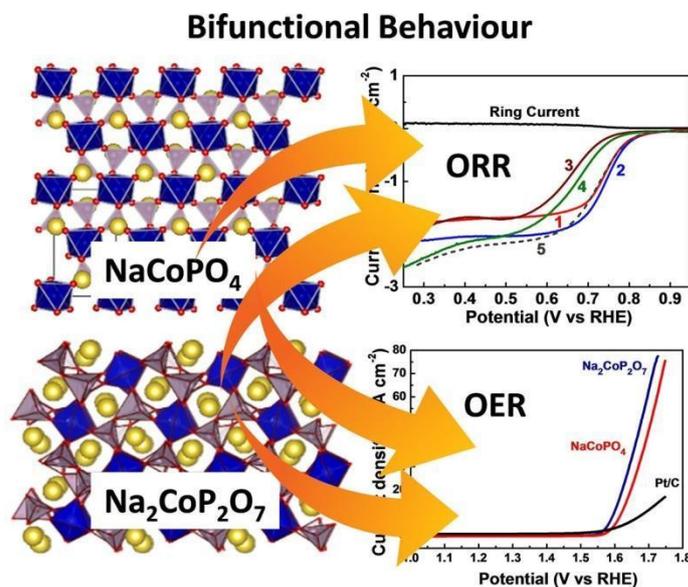
5. Geetharani K (IPC)



The primary aim of our research is to develop non precious transition-metal-catalysts for the syntheses of organoboranes which are important intermediates in c-c coupling reactions, medicinal chemistry, agrochemical industry and the like. We have developed an efficient synthetic route to organoboranes using inexpensive, less toxic Fe and Co based catalyst.

Reference: Communicated (unpublished)

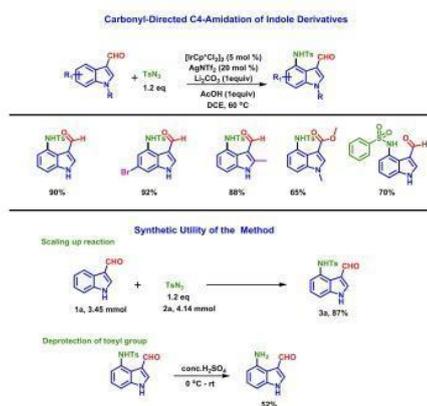
6. Prabeer Barpanda (MRC)



To produce cost-effective catalytic materials and replace the expensive Pt and Rh systems, researchers have explored various metallic and oxide compounds. This study demonstrates sodium battery insertion materials like NaCoPO₄ and Na₂CoP₂O₇ with promising oxygen reduction reaction (ORR) and oxygen evolution reaction (OER) bi-functional electrocatalytic activities. They offer an economic option to design efficient electrocatalytic materials.

Reference: R Gond, K Sada, B Senthilkumar, and **P Barpanda** (2018) Bifunctional electrocatalytic behavior of sodium cobalt phosphates in alkaline solution.

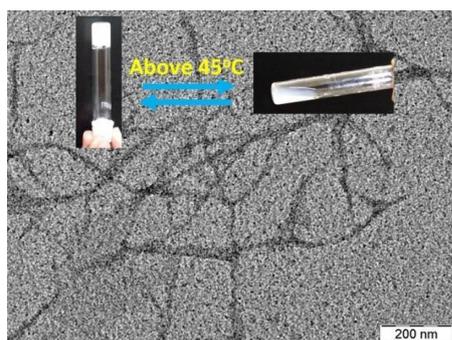
ChemElectroChem. 5, 153.



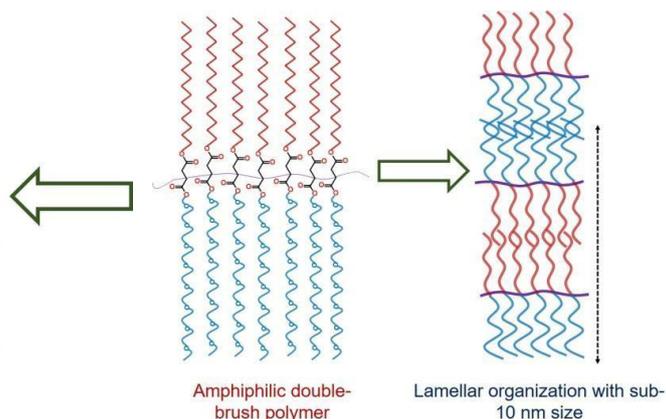
C4-Decorated indole scaffold features in a plethora of bioactive molecules, natural products, and functional materials. While their syntheses traditionally involved largely harsh stoichiometric reaction conditions, Prabhu and co-workers accomplished an unprecedented C–H activation strategy, for the formation of C–N bond of indoles at the C4–position as illustrated in the scheme.

Reference: V Lanke and **KR Prabhu** (2017) Iridium(III) catalysed regioselective amidation of indoles at the C4-position using weak coordinating groups. *Chem. Commun.* 53, 5117.

8. S Ramakrishnan (IPC)



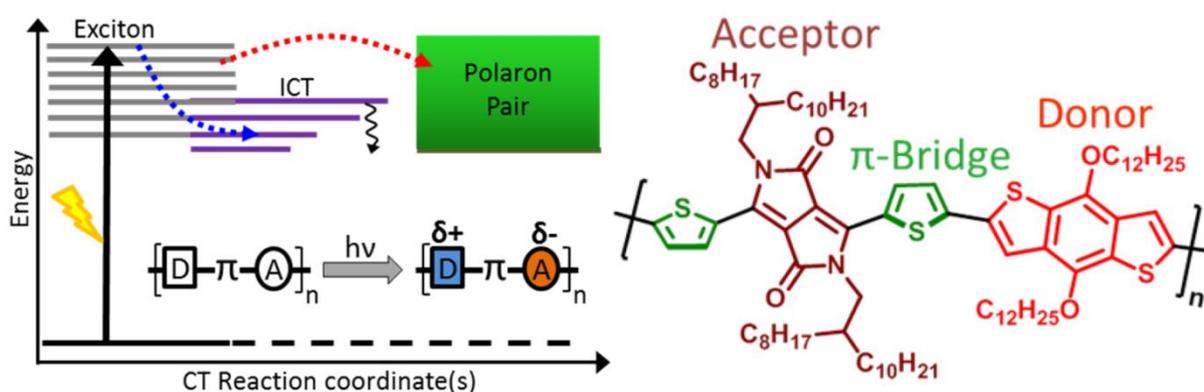
Temperature and shear-responsive hydrogel



Immiscibility between two closely spaced pendant segments along a polymer backbone drives the chain to adopt a conformation that segregates the segments on either side of the chain. When one of the pendant segments is water-soluble, it then leads to their self-assembly to form a hydrogel; remarkably, this hydrogel transforms to a sol upon application of either shear or heat.

Reference: S Chakraborty, SG Ramkumar and **S Ramakrishnan** (2017) Amphiphilic Double-Brush Polymers Based on Itaconate Diesters. *Macromolecules*, 50, 5004

9. Satish Patil, Professor, Solid State and Structural Chemistry Unit

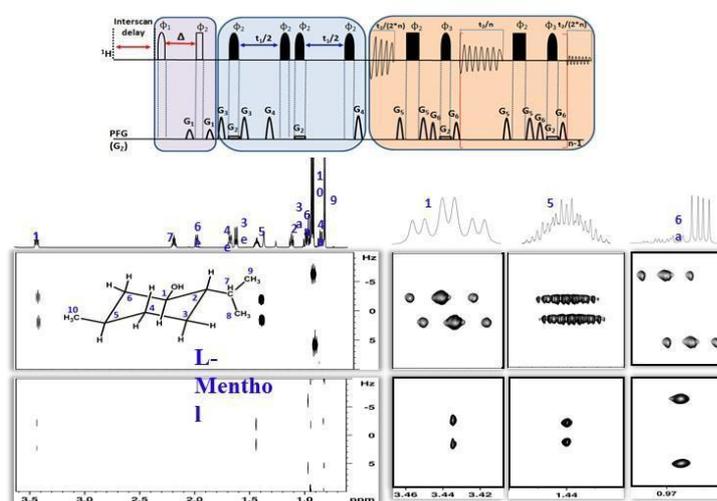


The study probed the transient structural evolution of the polymer backbone during the generation of the intramolecular charge transfer state. In order to optimise the performance of organic photovoltaic devices, the authors investigated the complex interplay between ultrafast polaron pair generation and exciton relaxation pathways (see Figure) via elucidation of the charge transfer reaction coordinate.

Reference: P Roy, A Jha, VB Yasarapudi, T Ram, B Puttaraju, **S Patil** & J Dasgupta (2017) Ultrafast bridge planarization in donor- π -acceptor copolymers drives intramolecular charge transfer. *Nature Comm.* 8, 1716. DOI:10.1038/s41467-017-01928-z

10. N Suryaprakash (NMR Research Centre)

PS-CLEAN-G-SERF: A Novel Pulse Sequence



The study reports a novel PS-Clean-G-SERF NMR experiment that completely eradicates the axial peaks while also preventing the evolution of undesired couplings from the complex NMR spectrum. The resultant two-dimensional spectrum of a selectively excited proton yields a pure shift spectrum devoid of any couplings with ultra-high resolution in the direct dimension and the scalar coupling information in the indirect dimension.

Reference: SK Mishra and N Suryaprakash (2017) Pure shift Edited Ultra High Resolution NMR Spectrum with Complete Eradication of Axial Peaks and Unwanted Couplings. *J. Magn. Reson.* 279, 74-80

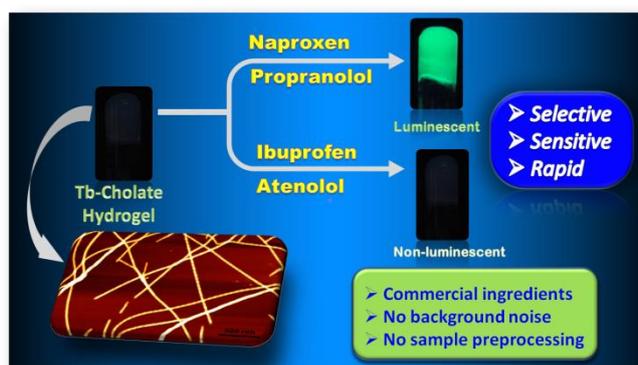
11. P Thilagar (IPC)



After having pioneered the concept of controlling the optical characteristics of luminescent compounds in solid state and solution by constraining the molecular conformations, we design and developed tetraarylamino boranes, the isoelectronic analogues of a tetraarylethenes. We observed that the triboluminescence characteristics of 2 are rare and they may find potential applications in light emitting devices, security markers and as damage detectors in civil structures and polymer objects.

Reference: KK Neena, P Sudhakar, K Dipak, and P Thilagar P (2017) Diarylboryl-phenothiazine based multifunctional molecular siblings. *Chem Commun.* 53, 3641-3644

12. Uday Maitra (OC)



Maitra's team has developed a simple method in which two common drugs, naproxen (painkiller) and propranolol (CNS active drug) could be detected selectively at sub-ppb levels in less than 2 minutes by 'turn-on' photoluminescence of a Terbium-cholate hydrogel. Closely related drugs such as ibuprofen (painkiller) and atenolol (CNS active) did not exhibit photoluminescence enhancement.

Reference: R Laishram and U Maitra (2017) Rapid Sensing of Specific Drugs at Sub-Ppb Levels by Using a Hybrid Organic–Inorganic Photoluminescent Soft Material. *Asian J. Org. Chem.* 6, 1235.