Journal of Sol-Gel Science and Technology

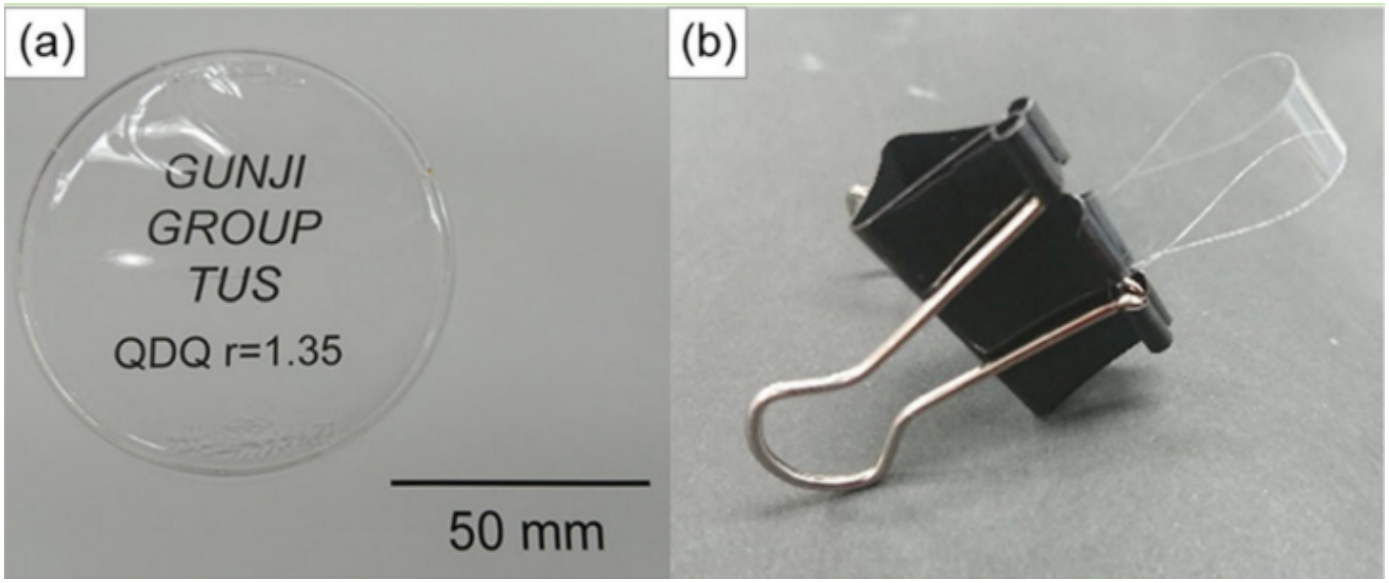
Micrograph of the Month

Introducing Micrograph of the Month! To highlight our authors and their works, each month we'll feature an interesting and visually striking micrograph (or series of micrographs) chosen from a recent issue of the Journal of Sol-Gel Science and Technology or from unpublished sources such as PhD theses, etc (with full attribution given). If you know of any interesting images that might be suitable, please contact the ISGS Newsletter Editor for inclusion. The micrographs can be optical, SEM, TEM, AFM, etc, and a brief description of the samples should be provided.

Also, check out ISGS Newsletter's sister highlight program, ***Molecule of the Month!***

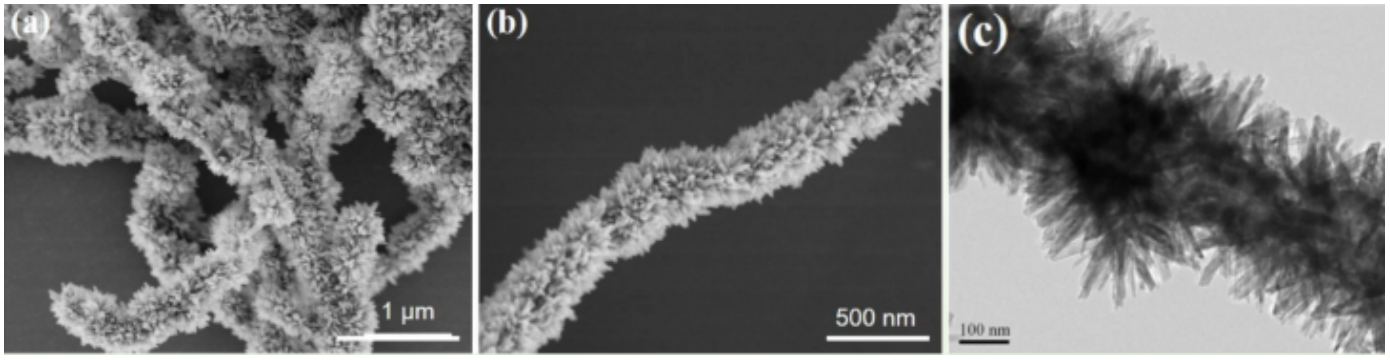
April and May 2022

This months' images are taken from four different papers in the latest issues of JSST and once again highlight the breadth of sol-gel science and technology, together with the areas in which our community is making an impact.



The first series is taken from the work of Yamamoto, Shimoda, Sato, Nakaya, Ohshita and Gunji entitled "*Preparation and film properties of polysiloxanes consisting of di- and quadra-functional hybrid units*" (JSST, (2022); https://doi.org/10.1007/s10971-022-05806-z), which explores the mechanical properties of colourless, transparent gel films prepared from siloxane precursors containing both di- (D) and quadra-functional (Q) siloxane groups. Varying the arrangement of D and Q moieties within the precursor enabled the mechanical properties of the hybrids to be modulated, with Young's modulus and fracture strengths of around 450 and 3.7 MPa being demonstrated.

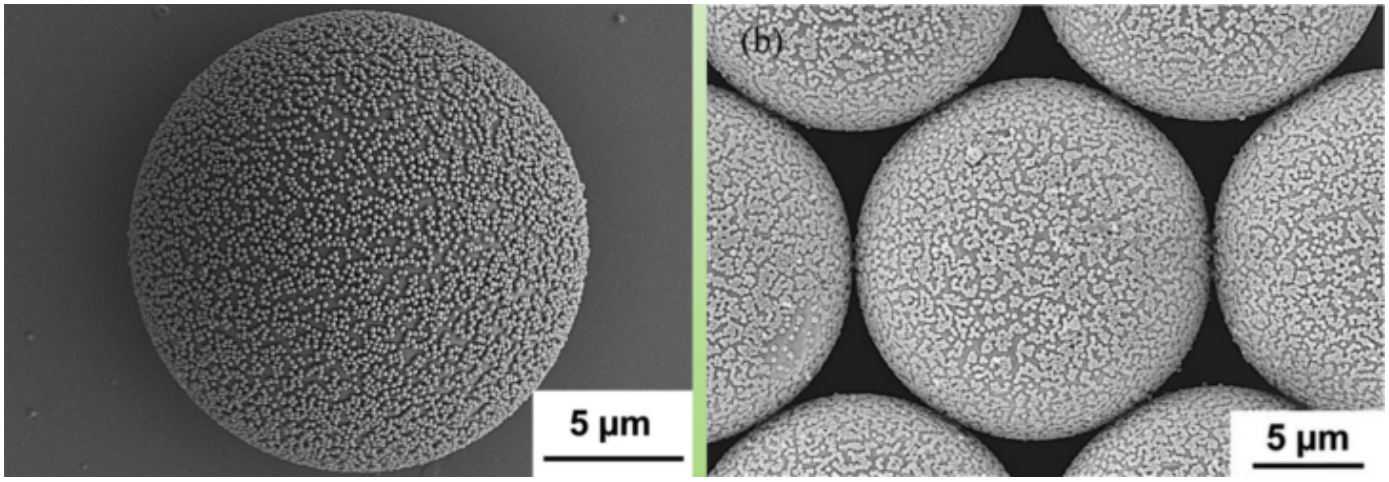
Read it here.



The second series of micrographs is from the work of Chen, Tao, Shang, Ma, Li, Cao, Li, Li, Li, Xiao and Zhang. This paper, entitled "*Rutile TiO_2 nanorods grown on carbon nanotubes as high-performance lithium-ion batteries anode via one-dimensional electron pathways*" (JSST, (2022); https://doi.org/10.1007/s10971-022-05835-8), explores the properties of rutile nanorods grown on carbon nanotubes via a microwave-assisted hydrothermal method. The intriguing morphologies obtained, which are illustrated in the micrographs below, yielded an initial discharge capacity of 315 $mAh.g^{-1}$ at 0.3 C when the materials were used as anodes in lithium ion batteries. This was substantially higher than the

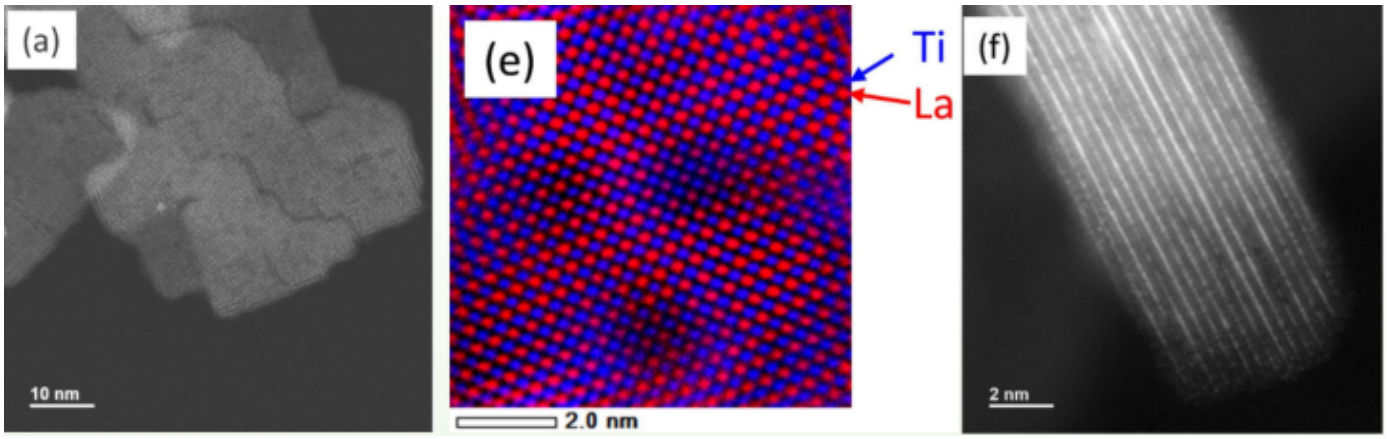
corresponding values obtained for physically mixed rutile and CNT or pure rutile. Excellent cycling performance was also demonstrated, with 93 % of the initial capacity retained at 1C after 200 cycles. The enhanced performance was attributed to the shorter electron-transfer distances via the onedimensional pathways established by the CNTs and TiO_2 nanorods.

Read it here.



The third series of images is from the work of Muto, Amano, Tan, Yokoi, Kawamura and Matsuda entitled "*Ordered arrays of electrostatically assembled SiO2–SiO2 composite particles by electrophoresis-induced stimulation*" (JSST, (2022); https://doi.org/10.1007/s10971-022-05854-5). This paper explores the formation of electrostatically-assembled SiO_2-SiO_2 composite particles from ensembles of monodisperse 200 nm and 16 µm particles. Composite particles consisting of a 16 µm SiO_2 core decorated with the 200 nm SiO_2 particles (left image) were initially assembled using polyelectrolyte adsorption to control the surface charge of the core and decorating particles. The assembly of these exquisite composites was subsequently achieved by applying controlled AC and DC electric fields to yield 2D hexagonal close-packed structures (right image) or an AC field coupled with gravitational sedimentation to generate ordered 3D hexagonal close-packed arrays.

Read it here.



The final series of images is from the work of Mimura, Hamao, Itasaka, Liu and Hamamoto. This paper, entitled "*Hydrothermal synthesis of perovskite-type solid electrolyte nanoplate*" ((JSST, (2022); https://doi.org/10.1007/s10971-022-05810-3), describes the hydrothermal synthesis of perovskite nanoplates with stoichiometry (A,La) TiO_3 (where A is either Li or Na). The phase purity of the nanoplates was modulated by the processing conditions employed, with a single-phase perovskite being obtained when NaOH was used as a mineraliser. The nanoplates had a thickness of around 10 nm and an average size of around 360 nm. Pellets fabricated from the nanoplatelets exhibited a conductivity of 3.8×10^{-6} S/cm following sintering at 1000 ^{o}C, which was an order of magnitude higher than the corresponding values obtained using commercial powders with a more conventional morphology.

Read it here.

January, February, and March 2022

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