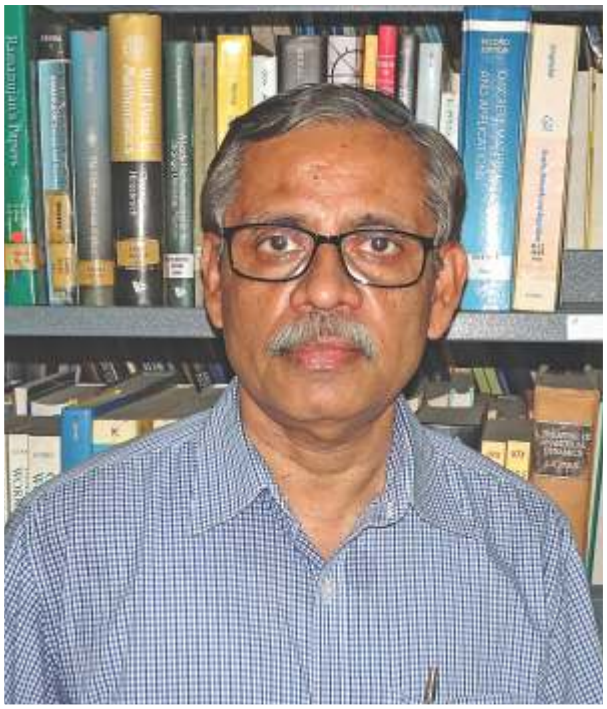

Goutam De

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Publications

a) In journals

1. Anuja Das, Arka Bikash Dey, Shreyasi Chattopadhyay, **Goutam De**, Milan K. Sanyal, and Rabibrata Mukherjee, *Nanoparticle Induced Morphology Modulation in Spin Coated PS/PMMA Blend Thin Films*, Langmuir, 36, 15270 – 15282, 2020
2. Prasun Choudhury, Shreyasi Chattopadhyay, **Goutam De** and Basudeb Basu, *Ni–rGO–zeolite nanocomposite: an efficient heterogeneous catalyst for one-pot synthesis of triazoles in water*, Materials Advances, 2, 3042-3050, 2021

Talks / Seminars Delivered in reputed conference / institutions

1. A lecture entitled "The importance of nanostructured coatings: Design and wet-chemical deposition" was delivered at the Curtain Raiser Ceremony of 6th India International Science Festival 2020; 05/12/2020; SNBNCBS; 05:15-05:45 pm

Awards, Recognitions

1. External Member of CRNN (Calcutta University) PhD committee, External member of "Faculty assessment committee of JNCASR"

Extramural Projects (DST, CSIR, DAE, UNDP, etc.)

1. Design and Fabrication of washable all-cotton 3 or 4-layer mask with controlled superhydrophilic/ hydrophobic surface modifications; In house (TRC); 10/09/2020- Continuing; PI /in collaboration with Prof S. K. Pal and CSIR CGCRI

Scientific collaborations with other national / international institutions (based on joint publications)

1. Indian Institute of Technology, Kharagpur; Sl. No. 1; National

Areas of Research

Synthesis & evaluation of functional nanomaterials and coatings

Project: Design and Fabrication of washable all-cotton 3 or 4-layer mask with controlled super-hydrophilic/hydrophobic surface modifications

Aiming to develop a 3 or 4-layer washable cotton mask we have fabricated several coatings. Following points are noteworthy:

1. Prepared several zirconia/silica-based hydrophobic/hydrophilic sols and deposited coatings by dipping method on Govt. permitted woven cotton fabrics with good breathing performance.
2. The hydrophobicity and hydrophilicity of the sols were controlled to obtain coatings with different water contact angles. For this purpose, 2 sets of coatings were prepared by controlling the

covalently bonded hydrophobic components (a) fluorine-based and (b) alkyl-based.

3. Silica-based superhydrophobic (alkyl-based) coatings doped with ZnO were also prepared on the cotton fabrics in order to obtain antimicrobial activity along with hydrophobicity.

4. Following Table summarizes the water contact angle (WCA/degree) data of the coated fabrics measured using 6 L water droplets:

Sr. no.	ZrO2-based fluorine series (ZF)	Sr. no.	ZrO2-based alkyl series (ZA)	Sr. no.	SiO2-ZnO (SZ)
ZF1	~0-<5	ZA1	~0-<5	–	–
ZF2	55±2	ZA2	47±2	–	–
ZF3	98±2	ZA3	92±2	–	–
ZF4	118±2	ZA4	120±2	–	–
ZF5	145±2	ZA5	135±2	–	–
ZF6	156±3	ZA6	144±3	SZ1	152±3

As shown in the above table that the surface wettability (WCA) of the cotton fabrics can be controlled from close to 0 to as high as 156° by controlling the sol compositions.

5. All the above coatings are very stable and durable. They have tested by dipping in different pH solutions (acidic to alkaline) for about 7 days, and found to be almost unaffected.

6. Interestingly the SiO2-ZnO coating sols can be lyophilized to dryness and the solids can be redispersed to obtain the similar coatings on fabrics.

7. Coatings were characterized by FTIR, SEM, XRD, PL, antimicrobial (SiO2-ZnO) and WCA measurements.

Based on the above data further work is in progress.

Other activities:

Analysis of our previously acquired data and discussion with collaborators for paper publication.

Plan of Future Work Including Project

(i) The ongoing activity on the development of superhydrophilic/hydrophobic coatings on cotton fabrics will be completed.

(ii) New work to be undertaken: Main problems of rooftop solar installations are biofouling, dust accumulation, reflection loss. These are causing severe loss of transmission, and the performance of solar modules deteriorate quickly. To solve the above problems antireflection cum self-cleaning hydrophobic coatings on solar cover glass could be very useful. Though the related dip-coating process is known (De et al, Ind. Patent Appl. No. 201811023896, June 27, 2018), further development of suitable sols using cheap chemicals and industrially more viable processes (brush coating, drum coating, roller coating etc.) are need to be developed. Therefore, future work will be done in this line keeping in view technology development.

(iii) Some ongoing collaborative basic research activities (Plasmon mediated hot electron transfer in metal nanoparticles, abrasion resistant refractive index controlled coatings) and technological work for TRC will be continued.

Any other Relevant Information including social impact of research

(i) Attended the Scientific Advisory Council (SAC) meeting of Institute of Advanced Study in Science

and Technology (IASST, DST), Guwahati during July 17-18, 2020 as a committee member.

(ii) Acted as a member of the board of examiners (External examiner) of a PhD thesis "Engineering Fragility of Hybrid Organic-Inorganic Perovskite for Diverse Applications" of IIT Kanpur (October 2020).

(iii) Attended as external expert for the 2 assessment committees (AC-I: Scientist F to G and ACII: Scientist E to F & D to E) of International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI, Hyderabad) held on 04/01/2021 (AC-I) and 05/01/2021 (AC-II)

(iv) Attended the CRNN (Calcutta University) PhD committee meeting as an external member on 02/02/2021 and 26/02/2021.

(v) Attended as an external member of the "Faculty assessment committee of JNCASR" held on March 25, 2021.

(vi) Manuscript handling of the Royal Society of Chemistry (RSC) journals, Journal of Materials Chemistry A and Materials Advances as Associate Editor. Also attended virtual meetings as Editorial Board member of those journals.

(vii) Nominated several names of Indian researchers (including SNBNCBS) to the RSC as 'Emerging Investigators', 'Lectureship award', 'Invited authors', 'Fellowship (FRSC)' etc.