



KONINKLIJKE
HOLLANDSCHE MAATSCHAPPIJ
DER WETENSCHAPPEN

Juryrapport

KHMW Jong Talent Afstudeerprijs voor Werktuigbouw en Materiaalkunde 2024

Ir. Anuj Joshi, TU Delft

Correlating Fluorescence and Stress/Strain for Spiropyran Mechanosensors

Four MSc theses were submitted this year for the Young Talent Award for Mechanical Engineering and Materials Science. The jury is very pleased with the high level of the submitted theses, representing the field in its full width: from solid mechanics to fluid dynamics, from thermodynamics to design, construction and control, covering applications from atomic levels to large infrastructures. They reflect the impressive quality of the mechanical and materials science education and research at our Dutch universities. The selection of a winner was not a simple task due to the excellent quality of the nominated candidates. After careful considerations, the jury unanimously decided to award the 2024 Young Talent Award to Anuj Joshi, a graduate of the faculty of Mechanical Engineering at Delft University of Technology, within the department of Materials Science and Engineering.

Anuj Joshi completed his MSc in Mechanical Engineering in 21 months, "cum laude". In the meantime, he worked also as a tutor and teaching assistant. His MSc thesis was awarded with an exceptional 9.5, while it was finished in only five months time.

He worked on an interdisciplinary topic between chemistry and mechanics: mechanophores, molecules that fluoresce under stress when embedded in polymers, a phenomenon with wide applications in damage detection, biomechanics, and the development of advanced materials. The connection between chemical and mechanical behavior in these systems is still poorly understood. Anuj's research made significant strides in this area, combining both experimental techniques and computational modeling to offer new insights into how molecular-level changes reflect macroscopic stress.

Not only combined his work two different disciplines, he designed and manufactured a test set-up for mechanical testing during which the optical response could be monitored closely using dedicated data acquisition, he characterized and simulated the deformations of the PDMS polymer during these experiments using finite element modelling, such that he could use state-of-the-art data analytics to identify and quantify correlations between the measured fluorescence and all possibly relevant stress and strain state variables. His findings pave the way for future quantitative measurements based on fluorescence measurements using these mechanophores. A high-impact manuscript based on mr. Joshi's thesis is currently in preparation, as well as a research grant application to take his ideas further.



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Taking all considerations into account, the jury is of the opinion that Anuj Joshi is the worthy and justified winner of the Young Talent Graduation Award for Mechanical Engineering and Materials Science 2024.

Prof. dr. ir. R. (Remko) Akkerman, hoogleraar produktietechniek Universiteit Twente
Prof. dr. M. (Moniek) Tromp, hoogleraar materiaalchemie en directeur Zernike Institute for Advance Materials Rijksuniversiteit Groningen

De jury vergaderde op 3 oktober 2024 via Zoom onder leiding van KHMW-maatschappelijk lid en bestuurslid mr. drs. P.P.M. (Paul) Nielen. Tevens was ter vergadering aanwezig prof. dr. A.P. (Ad) IJzerman, bestuurslid en secretaris natuur- en medische wetenschappen KHMW.