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Letter of Recommendation for Mr. Pritiranjan Mondal

I am pleased to write this letter to strongly recommend Mr. Pritiranjan Mondal for the **Sun Pharma Science Foundation research fellowship**. Pritiranjan is a senior Ph.D. student in the Department of Materials Engineering at IISc. I serve as his Ph.D. research advisor. I have known Pritiranjan for six years as a student in the Department of Materials Engineering at IISc. He is a talented and motivated young researcher who has been excelling at this early stage of his career. Pritiranjan joined my group after completing his M. Tech in Materials Science and Engineering from IIT, Kharagpur.

His doctoral research is primarily focused on developing multifunctional hydrogels with injectable, self-healing, and shape-morphing capabilities for biomedical applications. His research presents many exciting findings and technologies with solid interpretation. Through his work, he has developed a new generation dual crosslinked degradable polysaccharide-based injectable multifunctional hydrogel as a minimally invasive delivery platform. Recognizing the limited bioactivity of such injectable gels, he also developed new nanoparticle surface modification techniques and incorporated the functionalized nanoparticles into multifunctional injectable hydrogels to impart multi-biofunctional activity to the gels for the first time that can drive their clinical adoption. These studies have been published in *Carbohydrate Polymers* 2022 and *Biomacromolecules* 2024, respectively. Both studies were appreciated by reviewers. In fact, the former is already well cited (>40 times in two years).

Another exciting area of his work has been the development of 4D printing techniques and bioink formulations. He established for the first time a new strategy for 4D bioprinting hydrogels that can exhibit rapid, sequential bi-directional shape morphing on a single stimulation, and the proposed technique is a material agnostic approach, which was published in *Advanced Materials Technologies*. He has also developed innovative polymer formulations to prepare 3D-printable hydrogels endowed with conducting and anti-freezing capabilities and reversible shape deformation capabilities, which offer new frontiers such as human-machine interfaces, wearable medical devices, soft robotics, biosensors, and engineered living systems in advanced biomedical fields under extreme temperature conditions. This study was recently published in the *Chemical Engineering Journal*. A leading bioprinting company has expressed interest in possible commercialization through potential licensing of the technology (for which a patent application has been filed).

He gets along well with others. He has also collaborated with several other group members of our lab and contributed significantly, which is reflected in several co-authorships in other papers. Overall, his tenure has been highly productive. He has five first-author

publications (and a total of 9 publications) and contributed to four patents. He also effectively mentored junior members of the group, who were productive during their stay in our group and have appreciated his mentoring.

Given his background, his technical strengths are in materials chemistry. He has ably combined his skills with the knowledge of biomedical sciences that he has acquired during his PhD tenure to ably develop innovative solutions to pressing clinical needs. He has worked with minimal supervision and technical input during his PhD to execute these projects. He has good communication skills. He is on the verge of completing his PhD. He has shown the hallmarks of a mature and accomplished researcher who has proven himself as an outstanding interdisciplinary researcher for tackling biomedical challenges.

I strongly recommend the application of Pritiranjan Mondal. I believe he will be a worthy recipient of the Sun Pharma Science Foundation research fellowship. Please do not hesitate to contact me if you have any questions.

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