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Letter of recommendation for Jayajit Das

It is my pleasure to recommend Jayajit Das for a faculty position. I first met him about 2 years ago when he joined Arup Chakraborty's group as a post-doc. My group conducts experiments that probe the physical properties of microstructured soft polymer materials. Jayajit and I have had many fruitful collaborations and discussions on subjects ranging from microphase separation in cross-linked polymers to diffusion across interfaces. My impression is based on these interactions.

Jayajit is a brilliant theorist with a powerful tool kit. He has exhibited mastery over both field theory and modern simulation techniques, including molecular dynamic simulations, Monte-Carlo simulations, etc. His enthusiasm for experimental results and his considerable theoretical skills would make him a valuable addition to any academic department. His background makes him relatively unique amongst young theorists who are, in most cases, either field theorists or more commonly, simulators.

Jayajit and I have worked on 3 problems together. The first problem concerned the formation of ordered phases in a cross-linked block copolymer gel. We were initially surprised by the experimental fact that reversible order-disorder transitions would occur in crosslinked gel, which is nominally considered to be a "locked" solid. Jayajit was intrigued by the result and began constructing a model to predict the phase behavior of crosslinked block copolymers. Very soon he made a prediction that the order-disorder transition temperature should increase with crosslinking density, and made quantitative predictions of how large the increase would be. We did the experiment he suggested and not surprisingly, found what Jayajit had predicted. We have written 1 paper on this subject and another is being written. The second problem that we have worked on is a multicomponent blend of two homopolymers and a block copolymer. The block copolymer has repulsive interactions with one of the homopolymers and attractive interactions with the other. We were originally motivated to study this system by weak analogies to oil/water/non-ionic surfactant mixtures. Our polymer system exhibits variety of complex phase transitions such as a re-entrant lamellae-to-microemulsion transition. These phase transitions cannot be explained by simple mean-field theories that we had used. In recent years, Glenn Fredrickson's group at Santa Barbara has developed simulation techniques that allow for fluctuation corrections. Jayajit has applied these techniques to our multicomponent blends,

and is making predictions that are close to our experimental results. The problems described thus far have been focused on dry polymer melts. The last problem has to do with the self-assembly of a tetrablock copolymer in water in the dilute limit. The two outer blocks of the copolymer are hydrophilic while the two inner blocks are mutually incompatible and hydrophobic. This leads to the self-assembly of vesicles and other planar structures. First we thought that simple self-consistent field theory might be adequate for obtaining a theoretical understanding of aggregation in our system, but we were wrong. It appears that membrane fluctuations are important in this case, and we had thus no choice but to work with Jayajit on this problem.

Jayajit has been generous with his time, both to my students and to me. One of my students was studying the diffusion of across surfactant-bearing interfaces and was unsure about how he should model his system. We had a meeting with Jayajit, and soon after that my student was able to work out the model along the lines of his suggestions. In this case, the model worked, and thus we did not have to ask for Jayajit's help to resolve yet another dilemma.

In summary, it has been a real privilege to have Jayajit here at Berkeley. He is a joy to work with. I think he will contribute positively in any department, particularly if there are experimentalists who work in the area of nanoscale self-assembly of synthetic and biological macromolecules.

If further questions remain, please do not hesitate to get in touch.

Yours sincerely,

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