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Shifting Phases for Patchy Particles – Effect of mutagenesis and chemical modification on the phase diagram of human gamma D crystallin[1] JENNIFER J. MCMANUS, SUSAN JAMES, RUTH MCNAMARA, MICHELLE QUINN, National University of Ireland Maynooth — Single mutations in human gamma D crystallin (HGD), a protein found in the eye lens are associated with several childhood cataracts. Phase diagrams for several of these protein mutants have been measured and reveal that phase boundaries are shifted compared with the native protein, leading to condensation of protein in a physiologically relevant regime. Using HGD as a model protein, we have constructed phase diagrams for double mutants of the protein, incorporating two single amino acid substitutions for which phase diagrams are already known. In doing so, the characteristics of each of the single mutations are maintained but both are now present in the same protein particle. While these proteins are not of interest physiologically, this strategy allows the controlled synthesis of nano-scale patchy particles in which features associated with a known phase behavior can be included. It can also provide a strategy for the controlled crystallisation of proteins. Phase boundaries also change after the chemical modification of the protein, through the covalent attachment of fluorescent labels, for example, and this will also be discussed.

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