Soluble Zwitterionic Poly(sulfobetaine) Destabilizes Proteins

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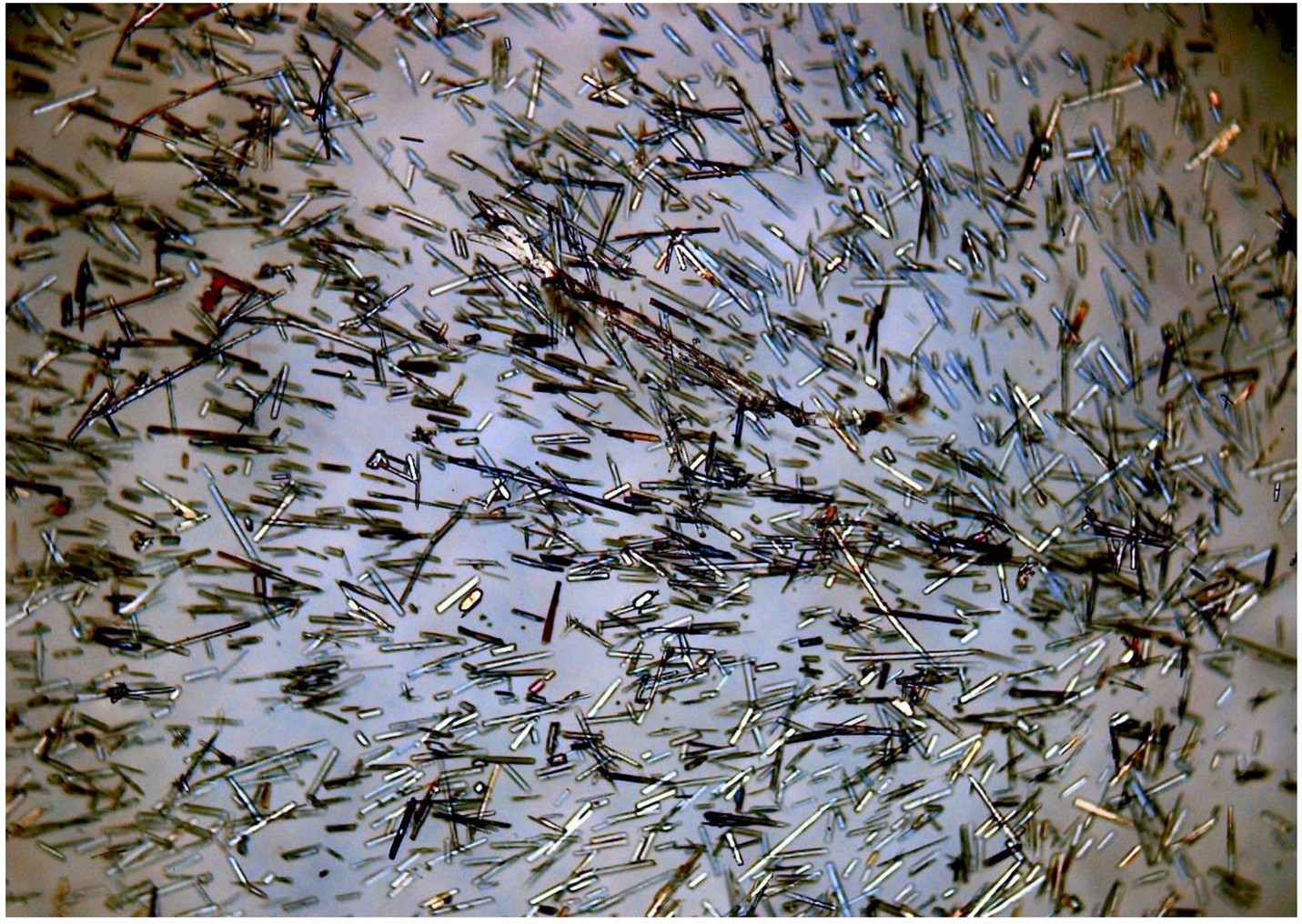

Proteins have proven to have tremendous potential in biological pharmaceuticals and drug targets due to their highly specific and complex set of functions and biocompatibility. In many cases, the key to successfully utilizing proteins for these applications is maintaining conformational stability and desired function. There is widespread interest in the use of water-soluble polymers such as neutral poly(ethylene glycol)and zwitterionic poly(sulfobetaine) (pSB) to stabilize proteins in solution due to their assumed low binding to proteins. However, differences in PEG and pSB-protein interaction mechanisms have yet to be completely understood. For example: despite the existence of complementary charged and polar patches on pSB and proteins, why would pSB not interact with proteins? This research demonstrated that poly(zwitterion) chains in solution can actually interact with proteins directly, reduce the thermal stability, and increase the protein folding cooperativity relative to proteins in buffer solutions. pSB was synthesized using atom transfer radical polymerization and characterized using dynamic light scattering (DLS). Displayed is an inspection light microscope image of 2.5% (w/w) pSB in a sodium phosphate aqueous buffer solution which was analyzed by DLS. DLS confirms that pSB follows the anti-polyelectrolyte effect where polymer solubility, solution viscosity, and polymer network swelling increases with salt concentration.