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Shear flow induced unfolding of collapsed polymers.[1] ALFREDO ALEXANDER-KATZ, ROLAND NETZ, Technical University Munich — In the process of clotting in small vessels, platelets form a plug in an injured zone only in the presence of a protein known as the von Willebrand Factor (vWF). The absence or malfunction of the vWF leads to a bleeding disorder, the so-called von Willebrand disease. It is believed that the protein is collapsed (or globular) when released into the blood flow, and that it undergoes a transition at high shear rates that allows it to bind platelets. Using hydrodynamic simulations of a simple model of the vWF in shear flow, we show that a globular polymer undergoes a globule-stretch transition at a critical shear rate. Below this threshold shear rate the polymer remains collapsed and slightly deformed, while above it the chain displays strong elongations in the direction of the flow. Finally, we discuss the relevance of our results in the case of blood flow, and compare them to the physiological values present in the body.

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