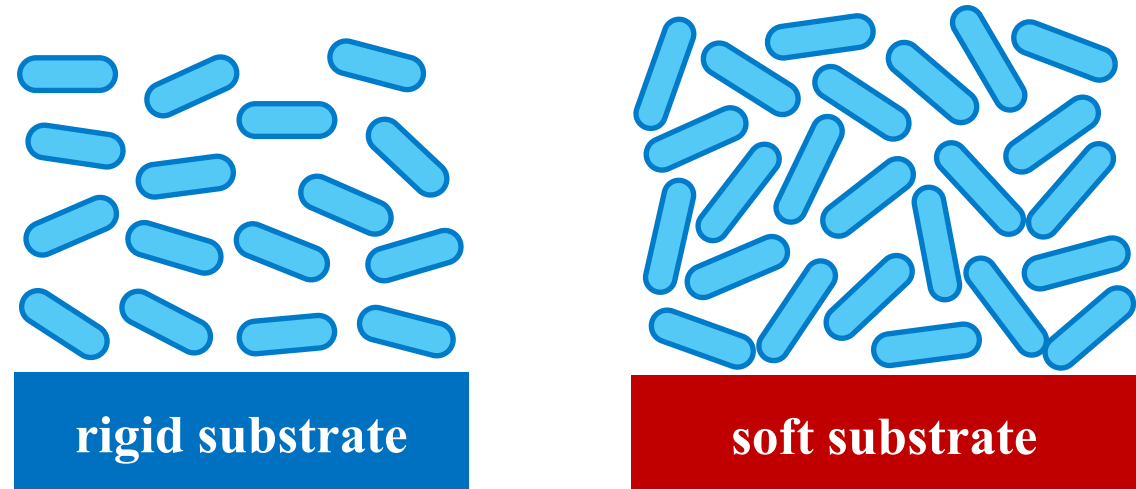


Zahra Fakhraai, University of Pennsylvania

Physical vapor deposition (PVD) can produce glass thin films with preferred orientation to the molecules and higher density than ordinary liquid-quenched glass by taking advantage of the fast movement of oriented molecules on the glass surface.

Research supported by Wisconsin MRSEC have found a new way to control the structure and properties of these films by growing them on soft substrates. PVD on a soft substrate can produce glass thin films that are much more dense and stable than those deposited on rigid substrates. A film deposited on a soft substrate in 2 hours is equivalent to a film deposited extremely slowly on rigid substrates over ~3000 years.

Small changes in the how soft the substrate is produce large changes in densities and orientational order in resulting glasses. This finding will help create materials with improved properties for applications ranging from flexible transistors to organic light emitting diodes to organic photovoltaics.



Substrate modulus affects the density and orientation of vapor-deposited molecules. On a rigid substrate (left) molecules tend to orient in-plane, while on a soft substrate (right), they assume more isotropic orientation and can pack at higher density.