

SUPER-SOFT AND SUPER-ELASTIC DRY GELS

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Molecular combs and bottlebrushes are a new class of polymer architecture allowing for anomalously low density of entanglements in polymer melts. The conformations and rheological properties of melts of these branched macromolecule composed of a flexible backbone and side chains densely tethered to it are investigated theoretically, experimentally and by computer simulations.^{1,2} We develop the rule for dialing in the desired value of the melt plateau modulus of these molecules as low as 1000 times below the conventional values for linear polymer melts and experimentally verify the validity of our theory. The theory also predicts that elastomers made from these melts should be super-elastic and reversibly stretch up to ten times more than elastomers made from linear polymers. Hybrid networks with both permanent and reversible bonds made with this novel architecture are predicted to be super-tough and self-healing.

References

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