MAR13-2012-020306

Abstract for an Invited Paper
for the MAR13 Meeting of
the American Physical Society

How Plastics Work

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We encounter plastics every day, but despite their widespread use, amazing range of properties, and basic scientific underpinnings, most physicists—like most people—know relatively little about plastics. In contrast to hard crystalline and amorphous solids (e.g., metals, salts, ceramics, and glasses), we take plastics for granted, select them carelessly, and examine them more closely only on a need-to-know basis. By ignoring plastics until we need them, however, we risk not knowing what we don't know and using the wrong ones. To repurpose a familiar advertisement, "there's a plastic for that." This talk will review some of the basic physics and science of plastics. It will examine the roles of temperature, order, intermolecular forces, entanglements, and linkages in plastics, and how those issues affect the properties of a given plastic. We'll stop along the way to recognize a few of the more familiar plastics, natural and synthetic, and explain some of their mechanical, chemical, and optical properties. The talk will conclude by explaining the remarkable properties of a plastic that has been largely misunderstood since its discovery 70 years ago: Silly Putty.