Regrettable Materials

Materials science is an enabling profession. We design, tailor, and improve the materials from which every engineering device is made—we're good at it and we're proud of it. Every thoughtful engineer, industrialist, and government official agrees with this analysis, although we cannot and must not stop repeating it to them every time we get the chance.

Because ours is a proud and confident profession, sure of its place in society, we can of course admit to having made a few mistakes in our early days. I don't imagine that any of us are happy with the choice of a steel with too high a ductile–brittle transition temperature for Liberty ships 60 years ago (except as a good set of examples for our classes on how not to do it!). Equally, we don't want to boast about having recommended high-alumina cement to bridge-builders around the world until we discovered in the 1970s its tendency to lose strength as it ages. Nor are we delighted that we failed to spot that one of the cheapest materials for thermal insulation—asbestos—has common variants which can induce lung diseases. Film buffs regret that early movies are on celluloid, which is degradable and flammable. However, these were all errors born of too little knowledge and understanding, and over my lifetime we have done a great deal to rectify that deficit.

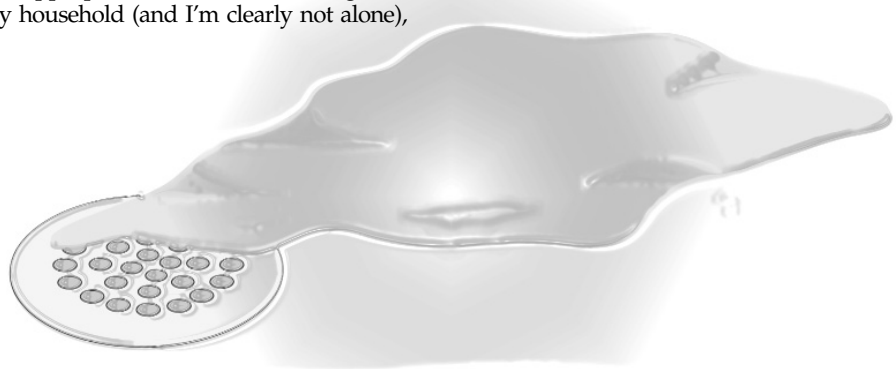
Less easily excusable but equally regrettable are several other materials choices. These result from the drive to reduce price, often combined with a total lack of taste or a misjudgment of function. In this category I include all clothing made solely from nylon. What a pity the use of nylon could not have been delayed until we knew how to reduce its sheen, improve its feel, and modify its propensity to attract static and cling. At least we have overcome that hurdle, and modern fibers are more subtle. But why is it that half the shirts I buy form creases easily, and ironing does not seem to remove them? The other half are fine: The problem is that, as with advertising, I don't know which half works until after I've spent the money! Another horribly regrettable material is chewing gum. Many cities of the world (and even the street outside my house) appear to be paved with sticky grey polka dots. At times it is like walking on Velcro. And now Singapore appears to be relaxing its most sensible prohibition—on the sale of chewing gum. Where is the world going?

Another whole area of materials abuse is associated with packaging. The only certainty about packaging materials is that someone, sometime, is going to need to remove them! Why then does so much packaging require a tool-not-readily-at-hand in order to open it? Particularly frustrating are thin films that fit the contours of the packaged object so closely that you cannot even insert a tool without the risk of damaging your cherished purchase. For some reason, smoked mackerel fillets (which I very much like to eat) seem to come in this tantalizing packaging. I can feel every ripple of their surface topology, but I can't get at the food. CD and audio cassette packaging is equally frustrating. The jewel case is so often cracked by the disproportionate effort needed to break into the "protective" wrapping. Even worse are the hard transparent packs in which the object of desire is held between two tough (in both the common and materials science senses of the word), transparent, molded sheets, welded together all round their periphery. I assume that these have been made to demonstrate the durability of the material and the strength of the weld. I can rarely break into packs like this without recourse to a pair of wire-cutters or a craft knife—neither of which I usually keep at hand by the kitchen table, where all domestic purchases are unpacked.

> Because ours is a proud and confident profession, sure of its place in society, we can admit to having made a few mistakes in our early days.

All of these errors of judgment or taste pale into insignificance beside the ultimate in inappropriate materials—shower gel. In my household (and I'm clearly not alone), it is decreed that soap is in some way "dirty" or "messy" and that every hand basin, bath, and shower must be equipped with a bottle or can of gel. The purpose of this product is to allow the user to coat his/her skin with a cleanser. Let's consider the showering process: The conventional way to transfer the cleanser from container to body is via the palm of the hand. The hand is by this time wet and must be cupped carefully to stop the gel sliding off immediately. If the surface to be treated is either vertical (like a leg) or down-facing (like the bottom of the foot), then the gel will immediately slide off and head straight for the drain. If the surface is inaccessible to the hand holding the gel (for instance the left armpit, for a left-handed gel-showerer), then a second application has to be made using the other hand. Scientific studies in my shower reveal that 97.36% of gel reaches the drain without having left any trace on the body. To achieve this excellent outcome we have to buy a large bottle or can, weighing more than its contents and which is the same size when empty for disposal. This heavy, bulky, high-energy-content, nondegradable container has been shipped huge distances just so that 2.64% of its contents can be applied to our skin. The competing product (snappily called "soap") comes wrapped in a thin, light covering that rarely requires a craft knife to cut open, is disposed of with almost no bulk, and may be biodegradable (snappily called "paper"). It requires no special skill to use and can be readily applied. Soap is certainly not a regrettable material. My friend and neighbor, who makes his living formulating shower products, would be delighted if any inspired materials scientist could suggest ways of improving the shear strength of the gel–skin interface. I have promised to pass your comments on to him.

PETER GOODHEW



https://doi.org/10.1557/mrs2005.24 Published online by Cambridge University Press