TRANSPARENT AND SOFT ELASTOMERIC COMPOSITES AND OIL/WATER BIPHASIC SYSTEMS WITH STIMULI-TRIGGERED RELEASE OF "INVISIBLE" LIQUID

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The synthesis, principles, and properties of a new class of stimuli-responsive soft matter biphasic composites will be introduced. The soft composite consists of more than 30% of aqueous solution emulsion (of micron-sized droplets) optically hidden in a matrix of silicone or hydrocarbon gel. Through delicate adjustment of the refractive index (RI) of the internal aqueous phase, the composite is completely transparent to visible light and the internally dispersed aqueous droplet phase is invisible to the naked eye. Multiple phases can be included in the form of gelled multiple emulsion. The composite exhibits unique stimuli-response capabilities, such as changing its optical transmittance upon mechanical, thermal, osmotic and other stresses. Intrusion damage causes the composite to release the RI matched aqueous phase, which causes change in transparency of color. In addition, when the composite is present in an aqueous medium where salinity is different from the dispersed phase, the osmotic pressure in the droplets causes instantaneous transparency change triggered by osmotic pressure. This enables us to measure osmotic pressure of the aqueous medium quickly. The new composites and gels could find many applications including a number of cosmetics and other consumer products with attractive and unusual appearance and stimulus-triggered active ingredients delivery.

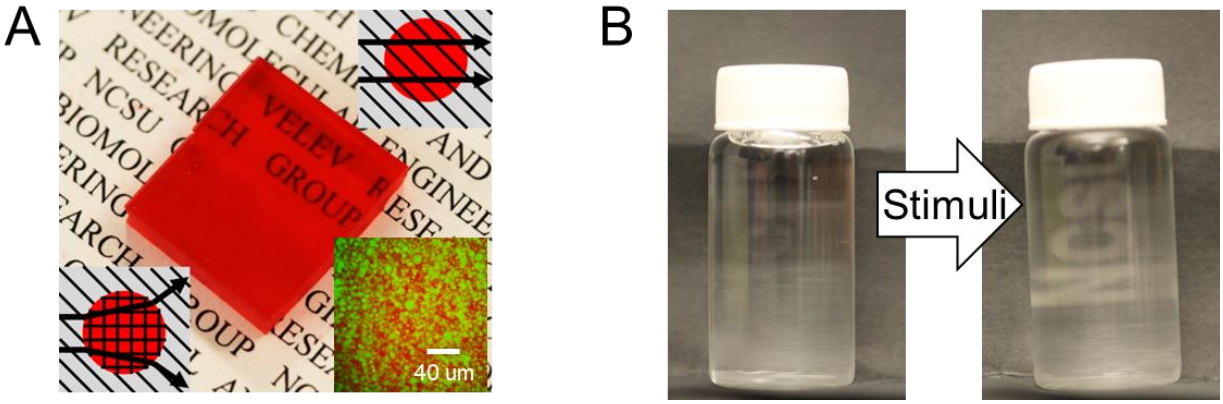

Figure 1 – (A) Example of a block of the multiphasic material after partial internal liquid release. (B) Images of the multiphasic material in a vial exhibiting optical property change (transparent → opaque) with osmotic pressure difference.