Synthesis and applications of new smart soft materials

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The synthesis of different hydrophilic polymeric networks, by in situ radical polymerization in the presence of graphene derivatives, gives rise to three-dimensional nanocomposite soft scaffolds. The role of the nanomaterial within the polymer network is primarily intended for the reinforcing (i.e. increasing the stiffness and toughness). However, we have shown that the presence of graphene can also enhance features such as biocompatibility [1], sensing [2], [3], or self-healing ability, giving rise to truly hybrid composites [4]. In addition, the ability of these materials to respond to different stimuli, such as electric fields, and the possibility of design following three-dimensional printing methodologies, paves the way for applications in soft robotics.
These materials require the production of large quantities of graphene easily dispersible in water, and for this reason, ball milling approaches developed in our laboratories have proven to be a method of choice for the preparation of graphene starting materials. [5]

References

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Figures

Figure 1: Hydrogel-based Mackibben muscle with self-healing properties.