

# Stress triggered colour-changing elastic materials for motivational dental applications.

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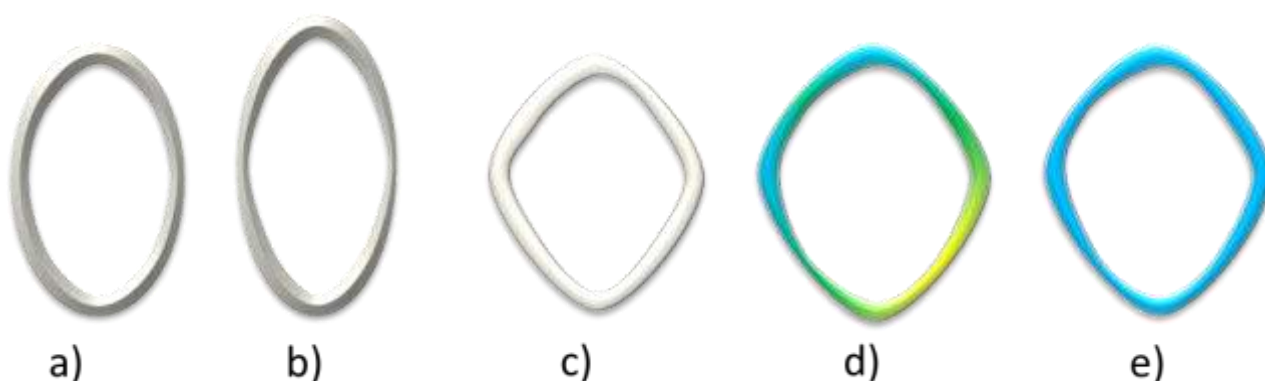
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Patient motivation to undergo treatment is very important in dental healthcare. A particularly challenging group are children, where the lack of willingness to follow a prescribed medical regimen can lead to ineffective therapy, especially in orthodontics. This problem is predominantly observed when everyday elastic ring-bands have to be worn between the fixed upper and lower orthodontic appliances (braces), even during daily activities including eating or teeth brushing. To overcome this problem, we propose to design and synthesize a colour-changing elastic material (**Figure 1**) for the elastic ring-bands. The dye molecules enclosed in capsules within the elastic matrix is released in response to mechanical stresses (**Figure 1c-e**), leading to colour changes and motivating child patients. In addition, the change in colour can inform an orthodontist and parents of whether these bands are worn.

In this work we will use *Pickering emulsions* stabilised by clay particles as templates for pigment encapsulation. Pickering emulsions consist of two or more immiscible liquids, either water-in-oil, oil-in-water, or multiple, which is stabilised by solid particles instead of surfactant molecules. Our experimental challenges include modification of clay particle surface chemistry for tailored capsule mechanical properties, optimization of interfacial polymerisation at the Pickering emulsion interior, toxicity of the capsules, and incorporation of the capsules in the ring-bands.



**Figure 1.** A schematic of elastic rings in dental applications: a) standard, b) the same ring after a day of usage, c) intelligent elastic colour-changing material before application, d) during the day, and e) after worn for a day.

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