

## High strength, antibacterial releasing dental composites with re-mineralising and adhesive potential

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Problems with dental composite restorations can include toxicity and or insufficient strength due to low monomer conversion (~50%). Furthermore, complex dentine adhesion processes, high polymerisation shrinkage and low toughness can lead to bond failure, bacterial microleakage and dentine demineralisation. The study aim was therefore development of high strength dental composites using flexible high molecular weight methacrylate dental monomers and high glass filler content to increase conversion and reduce shrinkage. The glass particles were then partially replaced by glass fibre to improve toughness, chlorhexidine (CHX) to provide antibacterial action and an adhesive monomer (PMDM) for dentine bonding. Mono and tri calcium phosphate (CaP) was also included. In the bulk these may react with absorbed water increasing volume to counteract shrinkage but at the surface remineralise carious dentine.

From FTIR studies, the base composite monomer conversion was ~70%. Flexural strength at 180 MPa was also comparable with the highest strength commercial dental composites. Fibres added up to 20 wt% significantly improved toughness without reducing strength. 5 wt% PMDM had no detrimental effect on strength. High strength (above 150 MPa) could also be maintained provided CaP and CHX levels were at or below 20 and 5 wt% respectively. 20 wt% CaP enabled sufficient expansion to balance polymerisation shrinkage. High PMDM levels could inhibit CHX release but CaP enhanced release. Novel tough, high strength, antibacterial – releasing dental composites have therefore been produced that are potentially also remineralising and self-adhesive to dentine.

### Biography

Anas Aljabo gained an MSc in dental materials from Queen Mary, University of London in 2010 after a degree in dental technology. He is currently in the second year of his Ph.D. at UCL Eastman Dental Institute under the supervision of Dr. Anne Young.