Minimally invasive procedures are the new paradigm in health care. They adopt the philosophy that integrates prevention, remineralisation and minimal intervention for the placement and replacement of restorations. Its principles dictate the need for clinically effective measures to remineralize early enamel caries lesions.\(^1\) Fluoride-mediated remineralization forms the cornerstone of caries management, but recently non-fluoride remineralizing systems strategies have been commercialized to promote deeper remineralization of lesions and reduce the potential risks associated with high-fluoride oral care products. These systems can be broadly categorized into biomimetic enamel regenerative technologies and approaches like fluoride boosters that repair caries lesions by enhancing fluoride efficacy.\(^2\) Biomimetic in restorative dentistry aims at creating a restoration that can be highly compatible with the structural, functional and biologic properties of dental tissues to reproduce and emulate the original performance of the intact tooth with high durability.\(^3\) Biomimetic analogues must be necessary to achieve functional mineralization and to recover the dynamic mechanical properties of teeth. This paper enlightens the rationale for non-fluoride remineralization and the mechanism of action, and evidence behind some of the most promising advances in enamel remineralization therapies.