The history of acrylic bone cement comprise a long period of time, Sir John Charnley being considered the founder of modern artificial joint replacement, as he started to develop the cementing in the late 1950s. Acrylic bone cements (ACB) are polymer-ceramic composites based on polymethyl metacrylate (PMMA), widely used in orthopaedics as suture materials and fixation devices. The main features of these materials are: 1) biocompatibility and ability to support new bone growth (osteocompatible) and 2) bioactivity (ability to form a calcium phosphate layer on its surface). The main function of the cement is to serve as interfacial phase between the high modulus metallic implant and the bone, thereby assisting to transfer and distribute loads. During years of follow up, cemented prosthesis with acrylic bone cements (ABC) demonstrated a good primary fixation and load distribution between implant and bone, along with the advantage of fast recovery of the patient. However, several problems are still persisting, as the orthopedic acrylic bone cements have to meet several medical requirements, such as low values of maximum cure temperature in order to avoid thermal necrosis of the bone tissue during the setting time, appropriate setting time (so that cement does not cure too fast or too slowly) and high values of compressive strength in order to withstand the compressive loads involved by normal daily activities. Generally, the improvement mechanical properties can be realized in three directions: 1) by searching alternative material to PMMA acrylic bone cements; 2) chemical modification of PMMA; and 3) the reinforcement of PMMA by adding different bioactive particles, antimicrobials, vitamins. The aim of this review is to explore the development of bone cements in the last decade, to highlight the role of bone cement additives with respect to mechanical properties and limitations of polymethylmethacrylate in orthopaedic surgery. The behavior of antibiotic-loaded bone cement is discussed, compared with other alternative additives including nano-fillers, together with areas of research that are now open to explore new insights and applications of this well known biomaterial.