

**Plenary talk Jérôme Chevalier**  
**Bioceramics 32**

<b>Titre (Title)</b>	:	<b>Zirconia ceramics for dental applications: current state and new options</b>
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<b>Abstract:</b>  40 years ago, Garvie and his Australian co-workers reported that the stress induced transformation of metastable tetragonal zirconia grains to the monoclinic symmetry could give rise to a powerful toughening mechanism. Their results even led them to consider zirconia systems as analogues of certain steels in terms of mechanical performances. This seminal paper generated extraordinary excitement in the ceramic community and led to a large variety of new applications, with a special interest in orthopedics first then in dentistry today. Zirconia in dentistry was first developed for dental restorations, for which translucency and optical properties must be associated to a high mechanical resistance and stability <i>in vivo</i> , then for implantology where biological integrations are also emphasized.  Here we show that ‘zirconia’ is not one, but a family of materials, with many different (mechanical/optical) properties. Playing with the microstructure (grain size), alloying (choice of dopant and content) and phase content through processing, it is possible to develop zirconia ceramics with a high degree of translucency and/or high strength and/or even a certain transformation-induced plasticity before failure. Thus, 40 years after their inception for structural applications, zirconia ceramics can answer different needs as a function of the targeted application/product. We will thus review the current choice of zirconia ceramics available for dental use and show current trends both for restoration and implantology. In particular, we present our recent work on ultrafine yttria-doped zirconia with an excellent balance between translucency-aging resistance-strength and on specific compositions that exhibit some transformation-induced plasticity before failure and strain-accommodation. These new developments may create new opportunities for clinicians in their practice.		