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# Crystallizing Glassesfor Reactive and for Rapid Laser Sealing

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**Abstract:** For joining of high temperature devices, sealing materialsare necessary, which have a thermal expansion coefficient adapted to the materials to be sealed. This can often only be achieved by a glass, which is crystallized during the joining process. However,the temperatures in conventional joining processes are not suitable for the encapsulation of temperaturesensitive components.By contrast,laser joining techniques enable to restrict the heat-input into the joining zone for ashort period of time. For that purpose, sealing glasses which can rapidly be sintered and crystallized are required.In order to obtain a joining material stable at temperatures in the range from room temperature to 1000 °C,glasses in the system $CaO/MgO/Al_2O_3/SiO_2$were melted and studied with respect to their sintering andcrystallization behavior and the resulting thermal expansions. It is shown for the joining of alumina that a crystallization time of 1 min is sufficient within an optimized heating cycle of 7 min for full densification and crystallization.
The second example is the sealing of metals by crystallizing glasses. Although the adherence of metals to glasses is usually good after sintering, the adhesiveness often decays during crystallization. To overcome this problem, glasses with reactive components such as NiO or CoO were melted. During thermal treatment, these glasses react with an iron containing alloys. Here, iron is oxidized while NiO or CoO are reduced to the metal. After crystallization, this results in an improved adherence which at least partly is caused by a strong interlocking.