

Supplementary Material

Interior-Collapsing Mechanism by Hydrothermal Process of the MgAl_2O_4 / MgO Porous Ceramic

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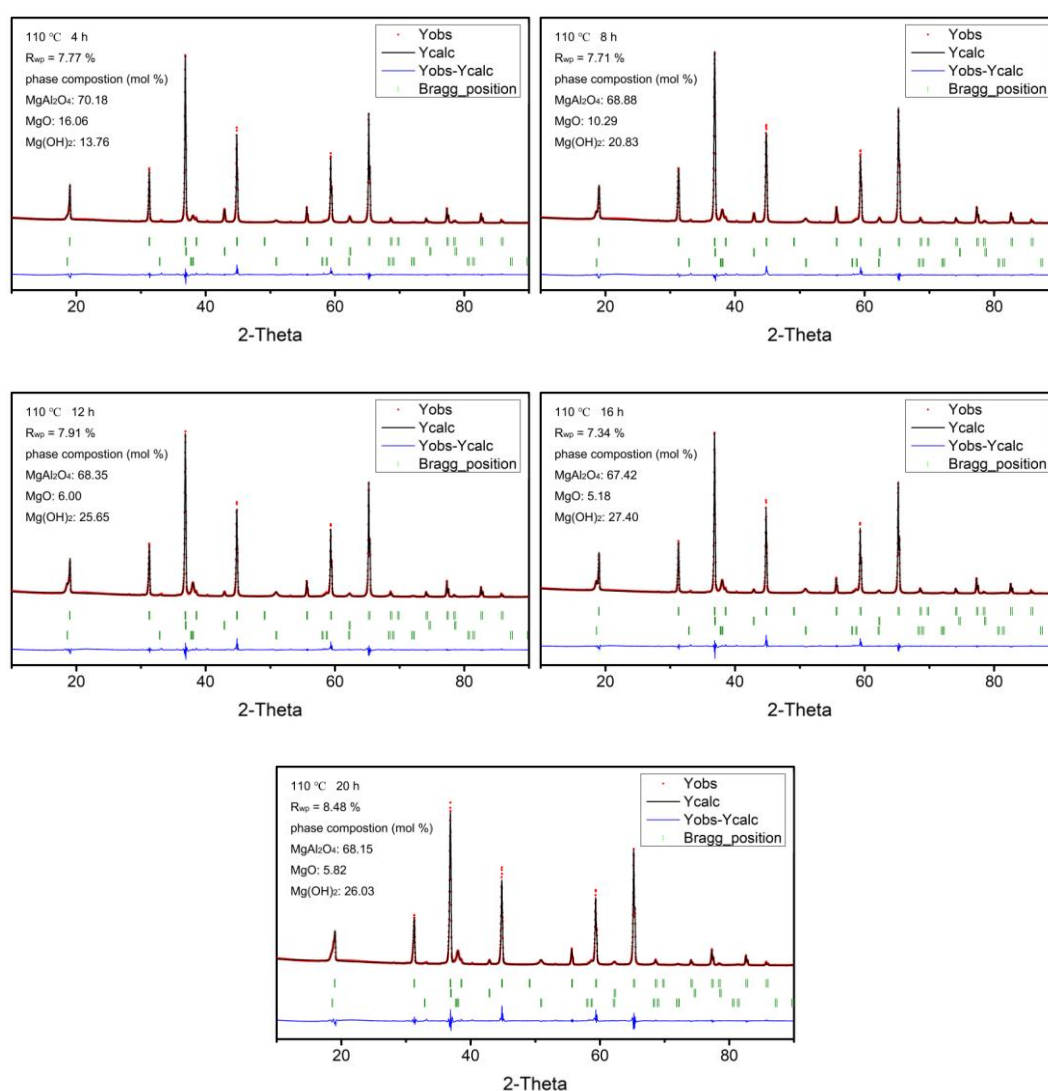


Fig. S1 Rietveld refinement patterns of the samples treated at 110 °C in deionized water.

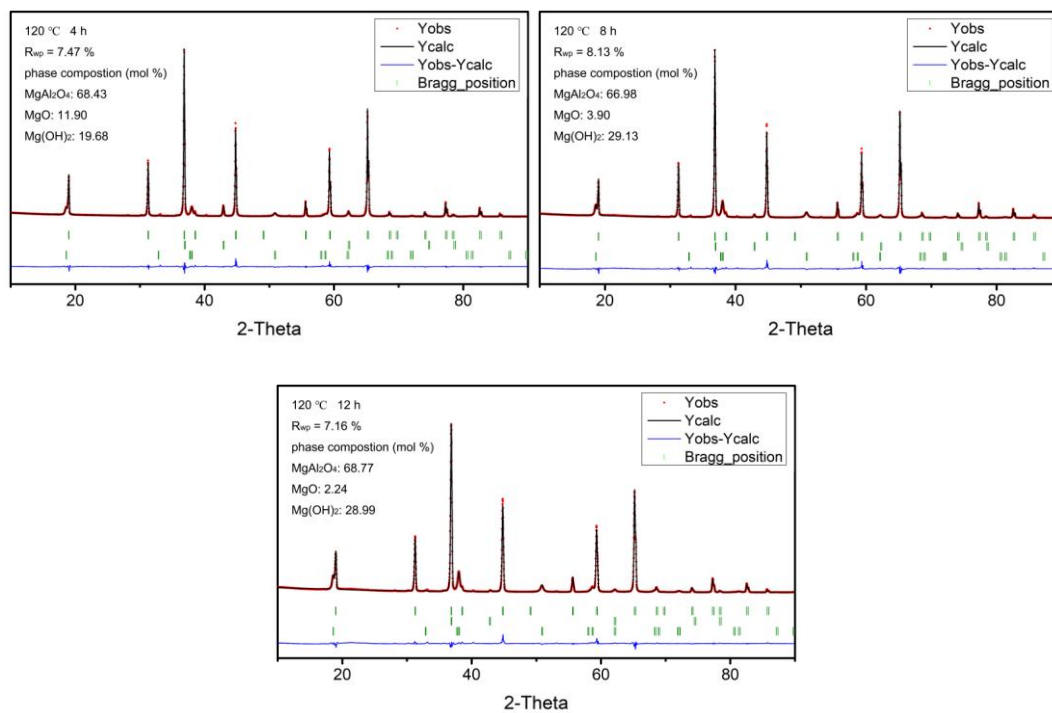


Fig. S2 Rietveld refinement patterns of the samples treated at 120 °C in deionized water.

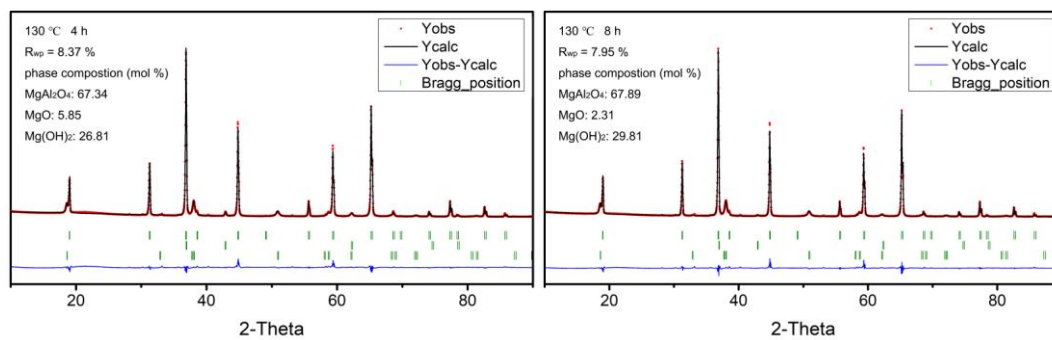


Fig. S3 Rietveld refinement patterns of the samples treated at 130 °C in deionized water.

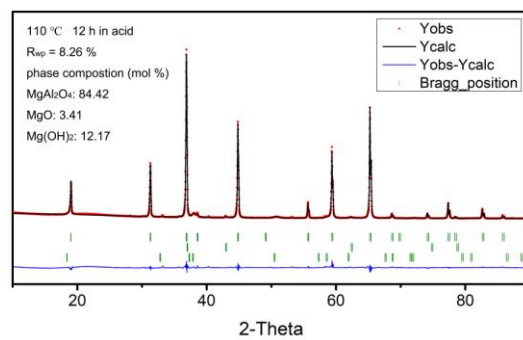


Fig. S4 Rietveld refinement patterns of the samples treated at 110 °C for 12 h in 0.1 mol/L acetic acid.

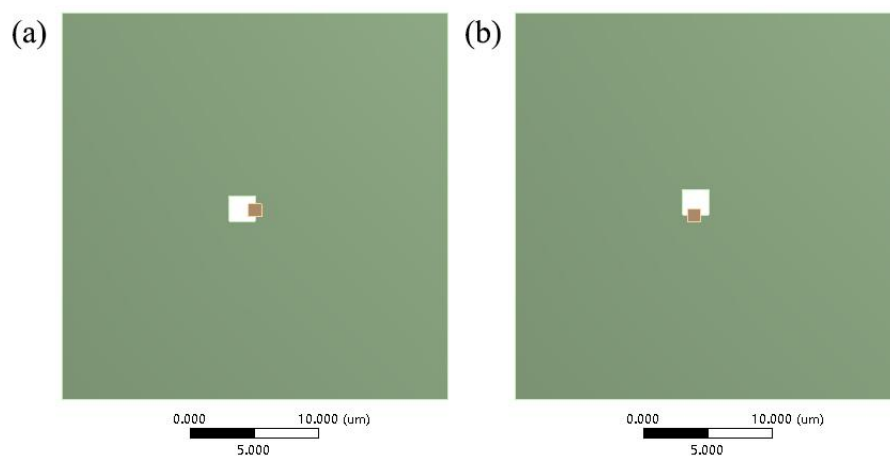


Fig. S5 Another restriction model of the MgO embedded in the MgAl_2O_4 matrix, (a) the c-axis of $\text{Mg}(\text{OH})_2$ perpendicular to the contact surface, (b) the c-axis of $\text{Mg}(\text{OH})_2$ parallel to the contact surface.

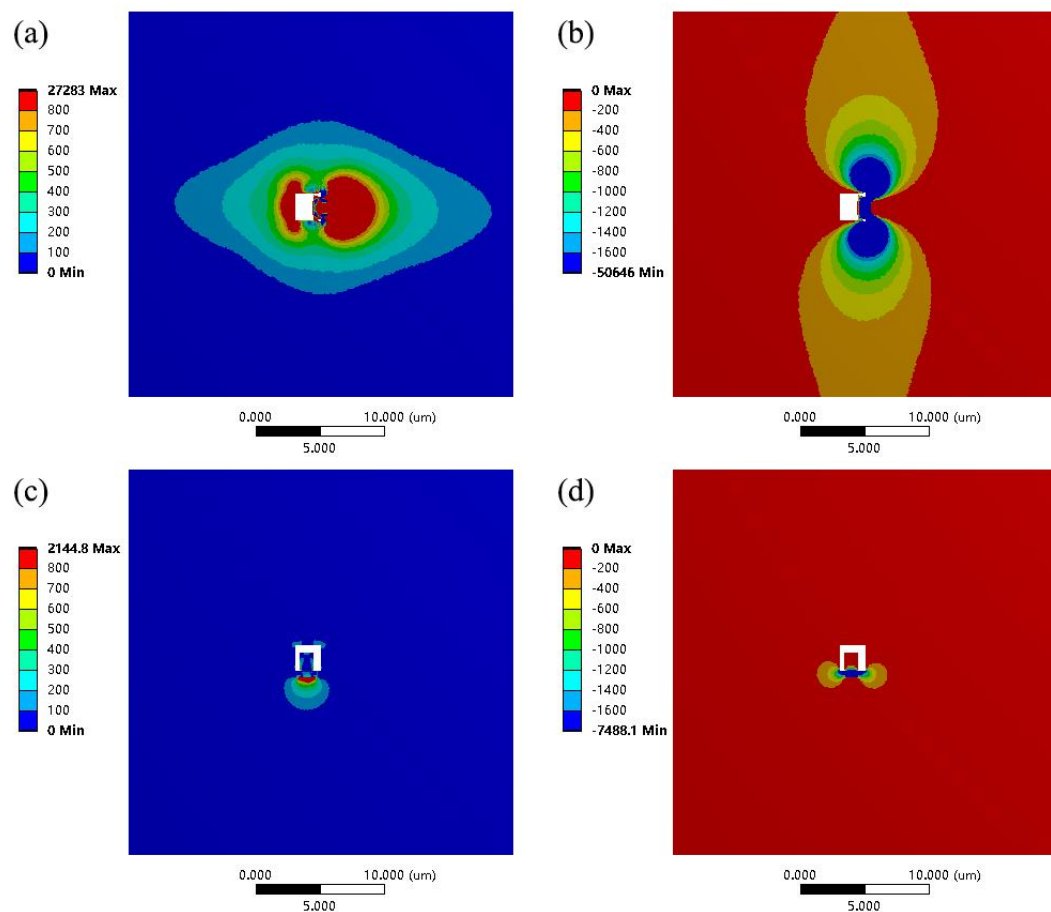


Fig. S6 Simulation result of the models presented in Fig. S6. Weaker stress was generated in this case, since not all the expansion was exerted to the matrix.

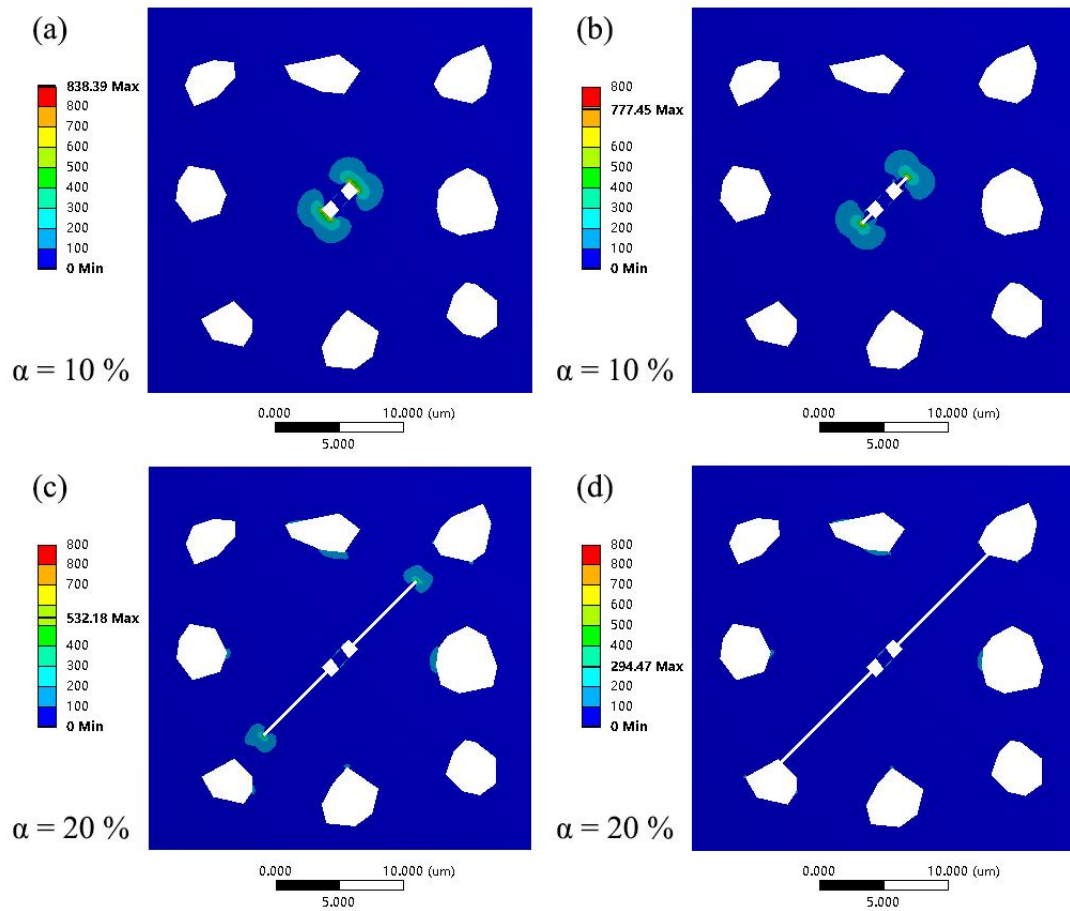


Fig. S7 Simulation of the behavior in the matrix resulted from the tensile stress. (a) During the expansion process, the tensile stress generated at the tip of the contact surface. (b) After the cracks occurred, the tensile stress concentrated at the tip. (c) With the MgO expansion, cracks propagated forward. (d) After the cracks reached the pore wall, the tensile stress was released, and the crack propagation terminated.

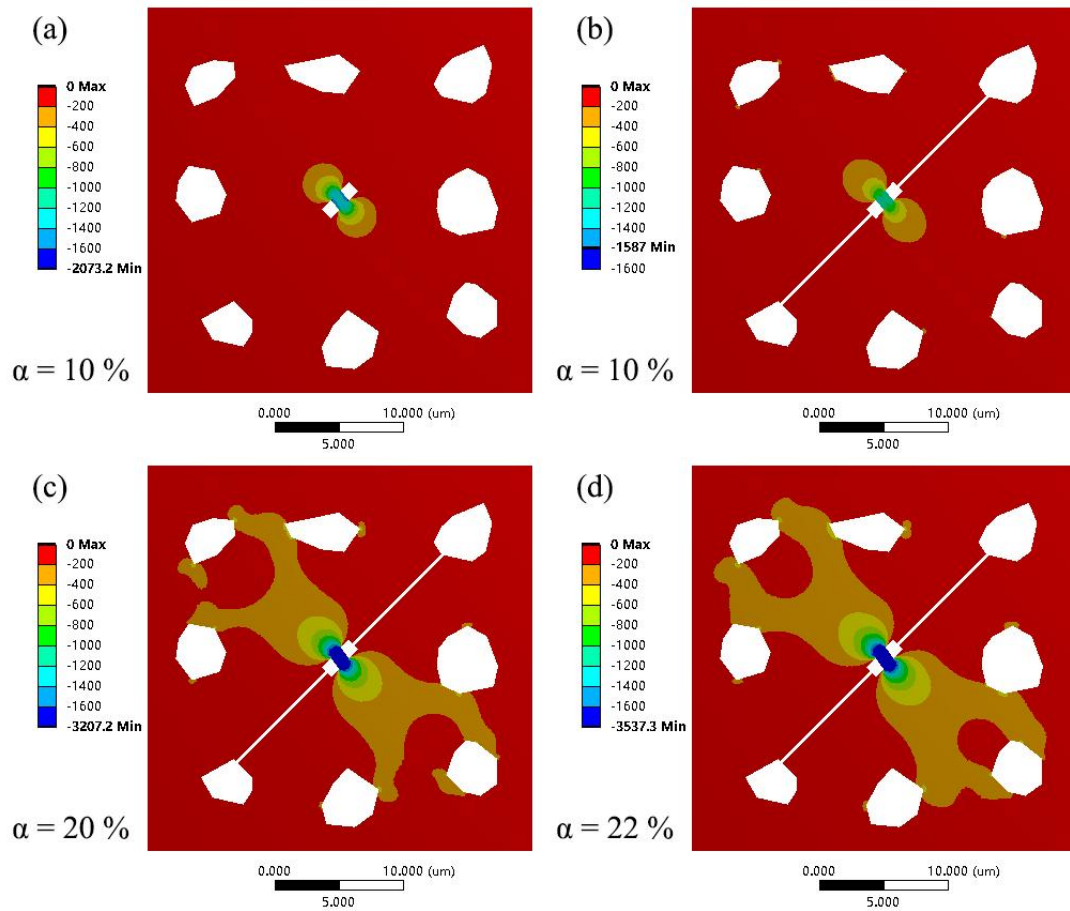


Fig. S8 Simulation of the behavior in the matrix resulted from the compressive stress.

(a) Compressive stress state before the cracks occurred. In the region with compressive stress higher than the failure stress, the intactness of the matrix was broken. (b) After the cracks occurred, the failure area became larger at the same hydration percentage. (c) With the MgO expansion, the failure area propagated to the pore. (d) After the pore wall was broken, the fragments of the failure area were accommodated in the pores. Thus the compressive stress would be released. The connection between the MgO grain and the matrix was broken.