Y_2O_3-ZrO_2 RATIO STUDIES FOR CMAS RESISTANT THERMAL BARRIER COATINGS PREPARED BY EB-PVD

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Thermal barrier coatings based on the yttria-zirconia system with compositions over 50 mol. % $YO_{1.5}$ rest ZrO_2 have shown potential as CMAS/Volcanic ash (VA) resistant coatings[1–4]. However, it is still not clear what Y-Zr ratio is the optimal to promote effective CMAS/VA arrest. A previous study has shown that pure Y_2O_3 coatings are not as effective as their yttria-zirconia counterpart[4] making this topic of high relevance for the development of CMAS/VA resistant coatings. Therefore, this study is based on the determination of the optimal Y-Zr ratio for EB-PVD TBCs produced with compositions ranging from 40-70 mol. % $YO_{1.5}$. Preliminary results for short term infiltration (up to 7 min.) at 1250°C with natural VA from the Eyjafjallajökull volcano show a tendency of increased infiltration resistance with coatings having a higher yttria composition (70 mol. %) seen from Figure 1[5]. The experiments indicate formation of reaction products when a 50 mol. % $YO_{1.5}$ coating composition is used and no significant reaction with lower yttria compositions. Thus, it appears that the threshold point to saturate the glass promoting formation of reaction products (apatite and garnet) is for compositions with at least 50 mol. % $YO_{1.5}$. A systematic study will be presented to determine the optimum yttia content in EB-PVD coatings for effective glass crystallization.

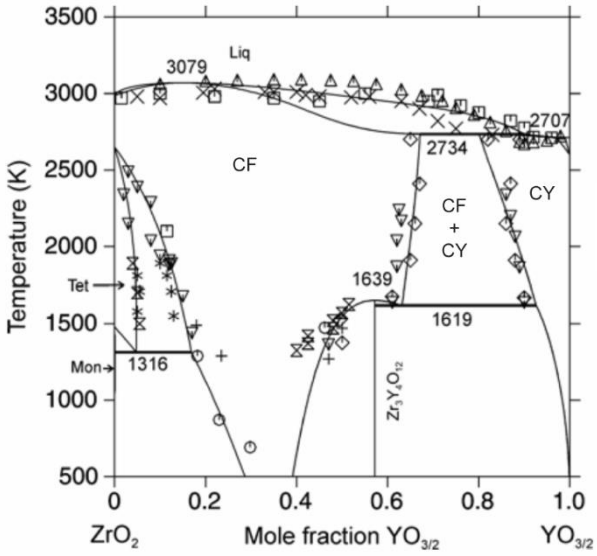

Figure 1 – Yttria-zirconia phase diagram where CF refers to the cubic fluorite YSZ phase and CY to the cubic yttria phase.

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