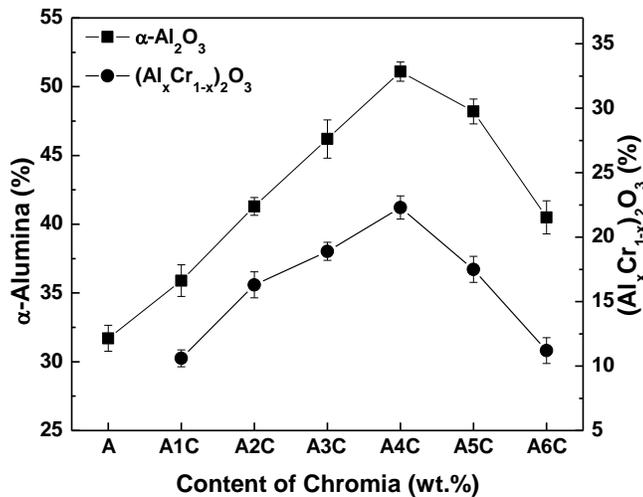


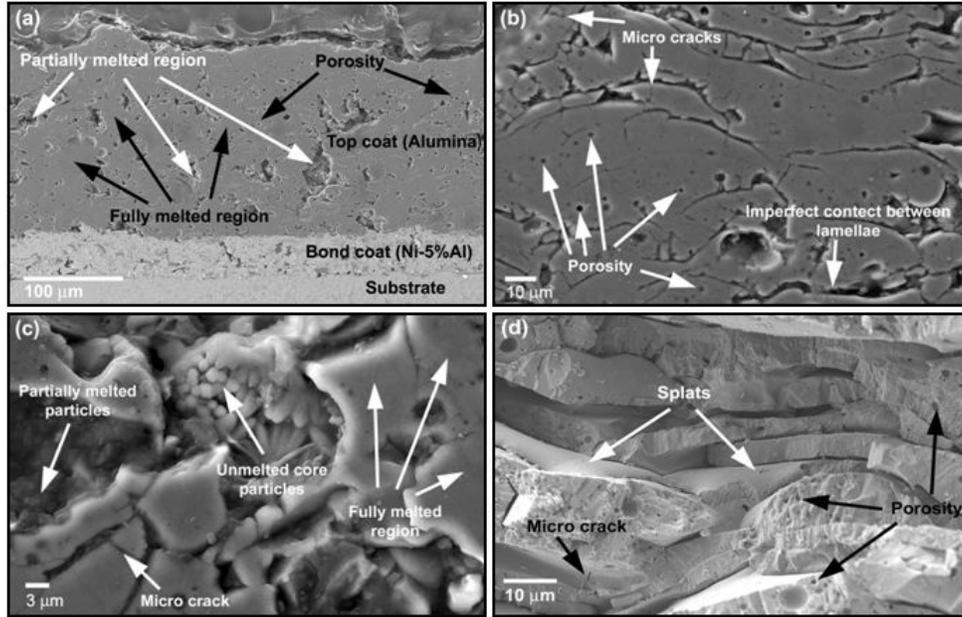
## Stabilization of phases present in plasma sprayed Alumina coatings

Stabilization of phases present in atmospheric plasma sprayed alumina coatings applied on steel substrates is possible by adding low quantity of Chromia to the alumina feedstock. Quantification of the different phases present in the coatings can be performed by subsequent use of Rietveld refinement method. Surface morphology, microhardness and wear behavior of the different coatings are also observed. Rietveld analyses performed on coatings ensure the stabilization of metastable phases present in the alumina coatings by chromia addition. Significant increase of the  $\alpha$ -alumina and  $(Al_xCr_{1-x})_2O_3$  content is observed in alumina coatings with 4wt.% chromia content. This is supported by the improved hardness and wear resistant properties of the alumina coatings containing 4wt.% chromia in it. The minimum surface roughness of the coating is also observed for alumina coatings with 4wt.% chromia content among all the alumina coatings with different chromia content. The formation of alumina-chromia solid solution and solidification of  $\alpha$ -alumina are found to be the reasons behind the enhancement in mechanical properties of the coating.

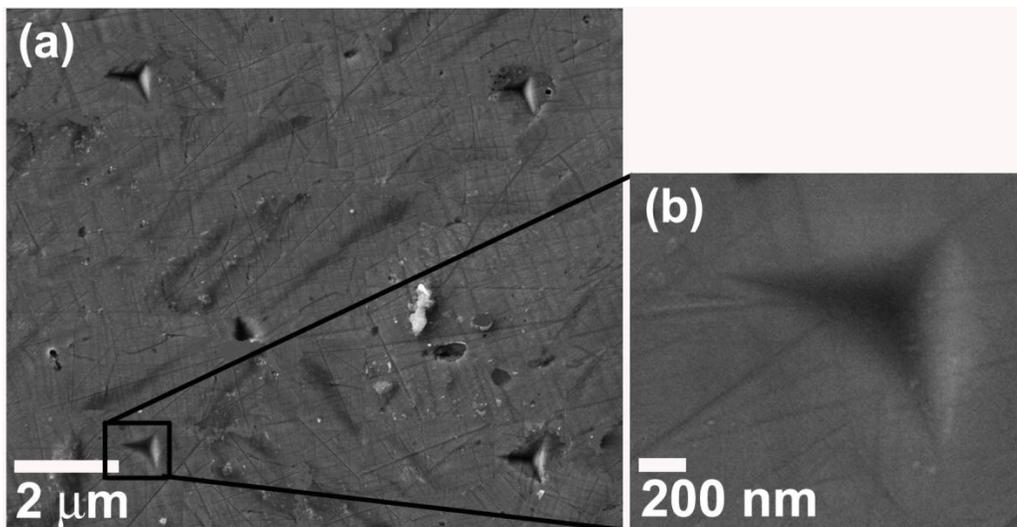
The distribution of phases and micro structural inhomogeneity on mechanical properties of alumina coating can be studied through nanoindentation technique. Young's modulus and hardness of the alumina coatings are analytically evaluated. Indentation stress-strain curves can be generated from the experimentally obtained load-displacement curves to characterize the mechanical properties of the coating. Distribution of the phases in the pure alumina coatings is evaluated and identified by nanoindentation technique.



Variation of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> and  $(Al_xCr_{1-x})_2O_3$  content in the Al<sub>2</sub>O<sub>3</sub>-Cr<sub>2</sub>O<sub>3</sub> composite coating with respect to Cr<sub>2</sub>O<sub>3</sub> content in Al<sub>2</sub>O<sub>3</sub> feedstock.



Morphology of (a) alumina coating (b, c) Enlarged view of alumina coating  
(d) Fractograph of alumina coating



SEM micrograph of Berkovich indentations (a) Four out of 49 indentations made and  
(b) magnified view of one representative indentation.