

Underlining the complexity of the structural and chemical characteristics of ectopic calcifications in breast tissues through FE-SEM and  $\mu$ FTIR spectroscopy

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**Abstract :** Breast calcifications defined as calcium deposits within breast tissue, can arise from a vast number of aetiologies. Diffuse or scattered distribution is typically seen in benign entities. At the opposite, approximately 95% of all Ductal carcinoma-in-situ, which represents 25-30% of all reported breast cancers are diagnosed because of mammographically detected microcalcifications. In this investigation dedicated to breast calcifications, we assessed at the micrometer scale their chemical nature through last generation microFourier transform Infrared microspectroscopy and their structural characteristics through last generation field emission scanning electron microscopy. Several striking results have been obtained. Heavily mineralized deposits seem to be the results of the agglomeration of micrometer scale spherules. For the first time, we show that these spherules display very different internal structure. Moreover, while Ca phosphate apatite and calcium oxalate dihydrate are the two chemical phases usually reported, we underline the presence of a third chemical phase namely amorphous carbonated calcium phosphate. In the case of duct carcinoma in situ (DCIS), the chemical composition as well as the carbonate level are very inhomogeneous even inside micrometer scale breast calcifications. Moreover, for some samples related to DCIS, special features at the micrometer scale seem to be specific to this pathology.