3D NON DESTRUCTIVE CHARACTERIZATION OF POROUS MATERIALS

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X-ray computed microtomography (CMT) is a miniaturized version of the well-known method of tomography used in medical diagnostics, but operating at a resolution of the order of µm [1]. This technique has been developed on various synchrotron X-ray sources [2] to optimize spatial resolution and contrast of 3D images [3, 4]. Although highest resolution images are achieved with these exceptional bright X-ray sources, research laboratories are now equipped with sufficiently high performance bench top systems to visualize and quantify 3D structure of heterogeneous or porous materials with a resolution of few µm. This technique has recently been used to characterize porous supports used in catalysis process.
In the case of catalytic supports, porous network is usually characterized by classical porosity measurements (BET surface area, Hg porosity, …) or microscopy images (optical or electron microscopy-see figure 1) obtained after fracture or sectioning. Regarding these destructive and operator time consuming methods, CMT may be now considered as a useful and effective imaging tool in material science.

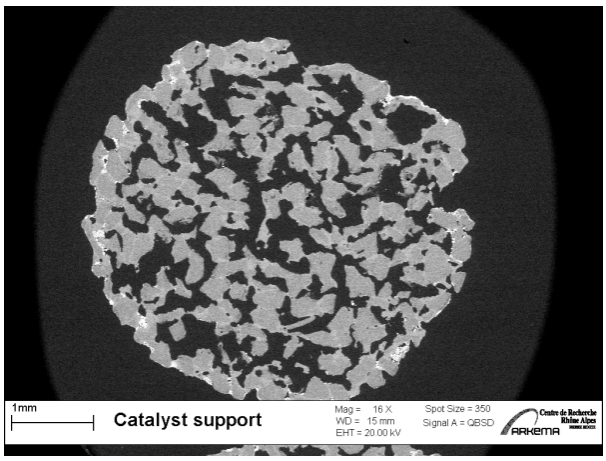

Figure 1: cross section scanning electron microscope images of porous catalytic support

We will illustrate the many possibilities of CMT in our R&D laboratory to visualize quickly the 3D structure of porous materials. Moreover, coupled with 3D image processing system (AmiraImage [5]), microtomography gives quantitative information (phase distribution, porous size measurements, connectivity parameters, …) on the whole porous network of the support or on localized parts of region of interest. 2D radiography images are used with in situ chemical and mechanical solicitation experimental devices to follow the modification of structure versus time. By increasing data acquisition speed, this 3D analysis technique will open a wide range of new applications.

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