The increased concentration level of toxic ozone, due to its release from copiers, printers and water purification systems, is known to be detrimental to human health. This implies the necessity to obtain more efficient catalysts for the ozone removal by decomposition. Various transition metal oxides or metals (Mn, Co, Ni and Mg), loaded on different supports (α-Al$_2$O$_3$, SiO$_2$, TiO$_2$ and activated carbon), have been investigated. Among them the silver modified catalysts show the highest activity in the reaction of ozone decomposition. Several chemical methods such as wet impregnation, sol gel or ion exchange are applied for the preparation of supported catalysts. During the last decades, the spray pyrolysis method is widely used to obtain thin films or nanosized particles of various chemical compounds. Samples of Bulgarian perlite, from mineral deposit (natural alumino-silicate glass) in the Rhodope mountain region of Djebel, were coated with Ag particles via spray pyrolysis method. This method allows uniform distribution of the silver particles on the outer shell surfaces. The SEM images show that the silver particles are uniformly applied to the surface of the support. The high porosity of the perlite granules is well visible, which renders it to be an appropriate support for depositing silver. The particle size distribution has been determined by TEM. Diffraction patterns were taken from TEM in order to obtain the structural details related to the specimen's orientation, polytype and phases after the decomposition. From the analysis of the images, it became clear that in the synthesis of the samples are obtained silver particles of different sizes in the range of several tens of nanometers to microns. The XPS, FT-IR and XRD methods have been also applied for characterization of the samples. The XRD investigations of the pristine samples revealed the formation of metallic silver and a small quantity of Ag$_2$O phase. The presence of silver was also confirmed by XPS analysis. It was established that Ag/perlite composite, prepared by spray pyrolysis is a promising catalyst for ozone decomposition. The high catalytic activity is preserved during the complete course of the catalytic reaction. After the catalytic activity test some structural and phase changes in the samples were observed. The XRD patterns of the ozonated samples revealed the presence of metallic silver, AgO and Ag$_2$O phases which has been confirmed by TEM. The FT-IR analyses revealed that some bands, assigned to Si-O-Si stretching modes, were shifted to lower frequencies after ozone decomposition test. In general, the spray pyrolysis method turned out to be very suitable technique for preparation of highly active silver coated perlite catalyst for efficient removal of ozone.

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Fig. 1: TEM micrograph of Ag/Perlite catalyst sample.