Electronic Supplementary Material (ESI) for RSC Advances.

Direct Cyanidation of Silver Sulfide by Heterolytic C-CN Bond Cleavage of Acetonitrile

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1. Material and Physical Measurements

1.1 Material Used

Silver sulfide (Ag_2S) and vanadium pentoxide (V_2O_5) was procured from Sigma Aldrich and E-Merck, respectively. The solvents (Acetonitrile and Ethanol) employed during the synthesis procedure were purchased from E-Merck. HCl used during the UV analysis was procured from E-Merck.

1.2 Physical Measurement

XRD data's were recorded in a BRUKER AXS, D8 FOCUS instrument and low angle measurement from 10-80°.

Fourier-transform infrared spectra (FT-IR) of the materials were recorded on a Perkin-Elmer Spectrum 2000 FT-IR spectrometer in the range of 500-4000 cm^{-1}.

The SEM images and EDX analysis of Ag_2S and V_2O_5 were recorded in scanning electron microscopy of Model- Zeiss, Sigma and Make- Carl ZEISS Microscopy, Germany at an acceleration voltage of 5 kV.

The Raman analysis of the material was obtained in an EZRaman-N (Enwave Optronics) Raman Spectrophotometer, having laser light of 150 mW, 785 nm incident wavelength through 100x (0.3 N.A) objective lens.

The X-ray photoelectron spectroscopy (XPS) of the sample was measured using Mg Kα (1253.6 eV) radiation as a source on a KRATOS (ESCA AXIS 165) spectrometer. The oven-dried samples (finely ground) were dusted on a graphite sheet (double stick) and mounted over the regular sample holder, before being transferred to an analysis chamber. Before recording the XPS, the material was outgassed overnight in a vacuum oven.

ESI-mass spectrums were recorded on ESI mass spectrometer from Agilent Technologies (1220 Infinity LC). High resolution mass spectrometry (HRMS) was recorded in a Q-Tof

ESI-MS instrument (model HAB 273) in acetonitrile (HPLC-grade). UV–vis absorption spectra for red solution were measured in Shimadzu, UV-2550 spectrophotometer.

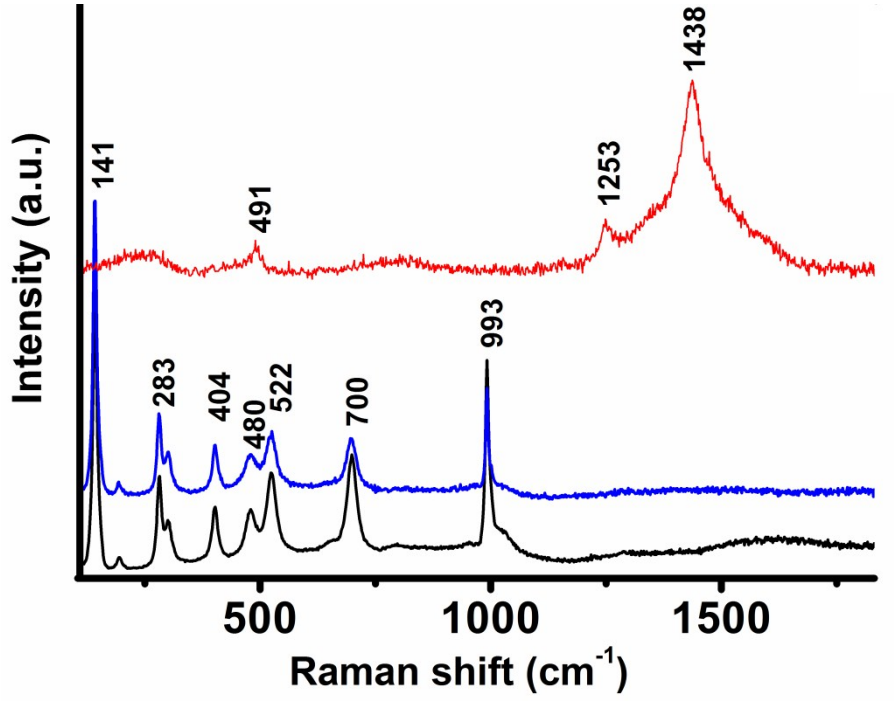

Fig. S1 Raman spectra of XRD pattern of V_2O_5 (black), Ag_2S (red) and V_2O_5-Ag_2S (blue).

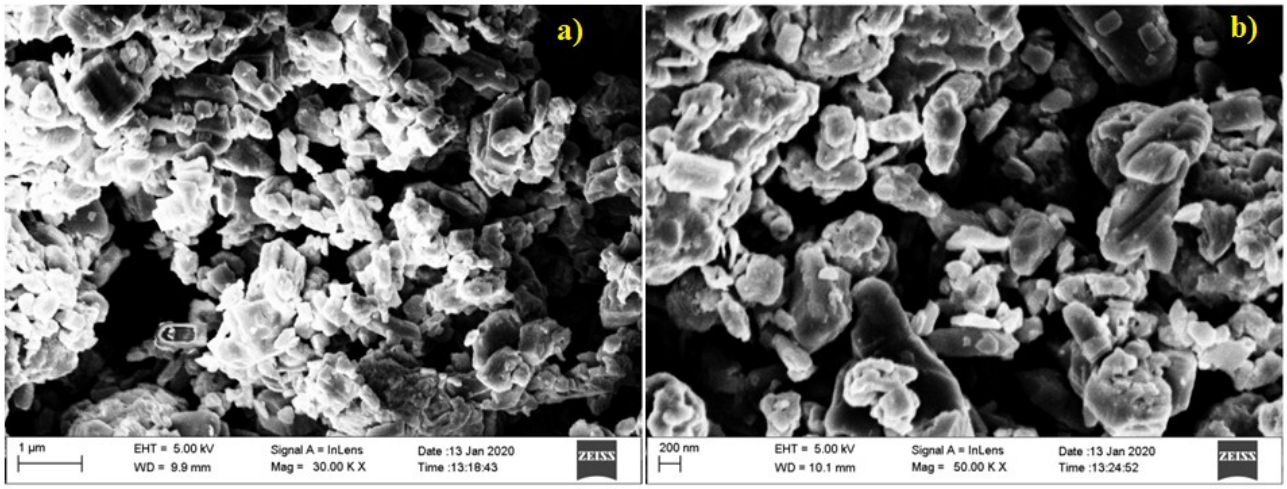

Fig. S2 SEM images (a-b) of V_2O_5-Ag_2S (1:1 ratio) composite in different magnification.

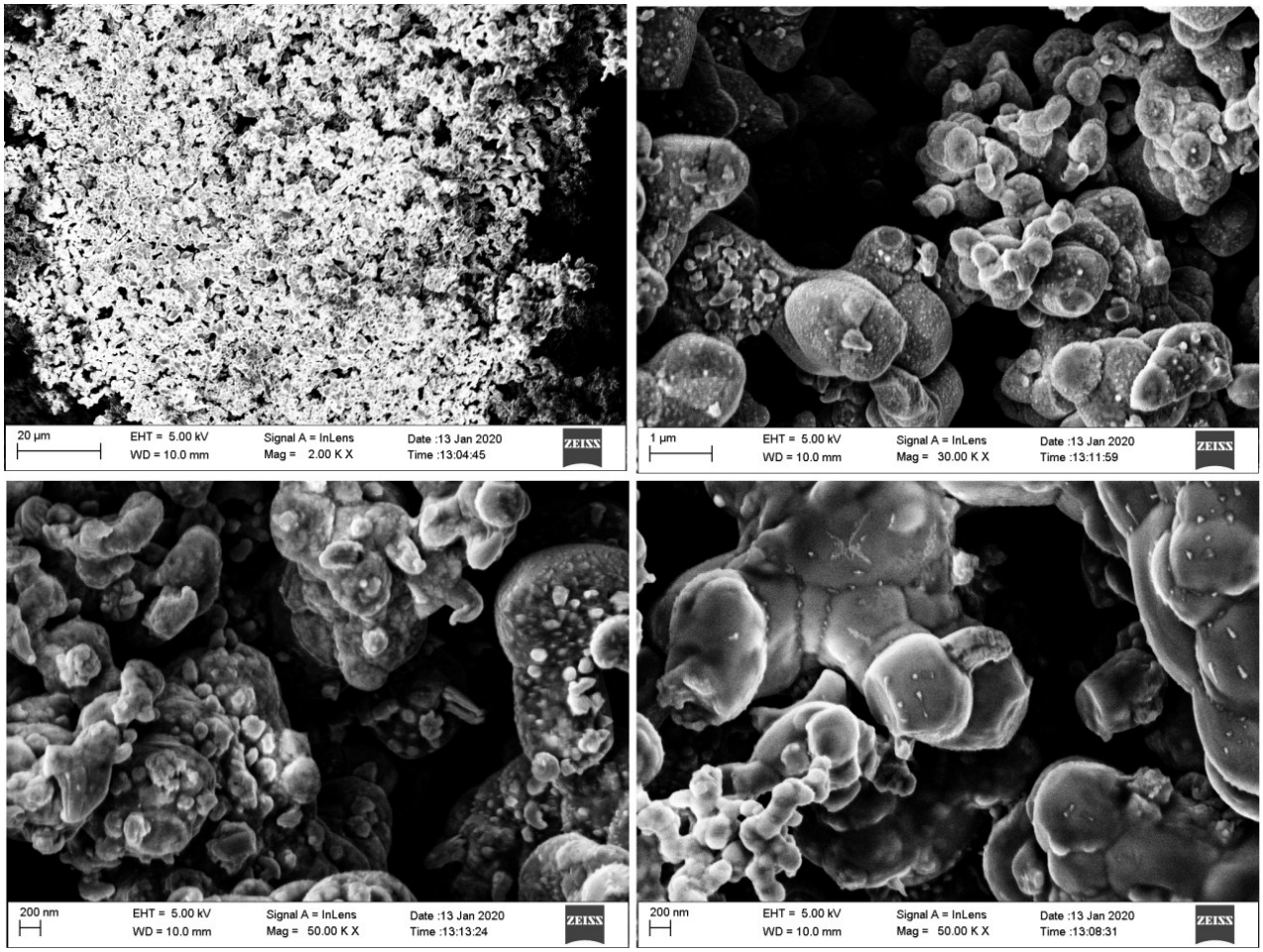

Fig. S3 SEM images of Ag_2S.

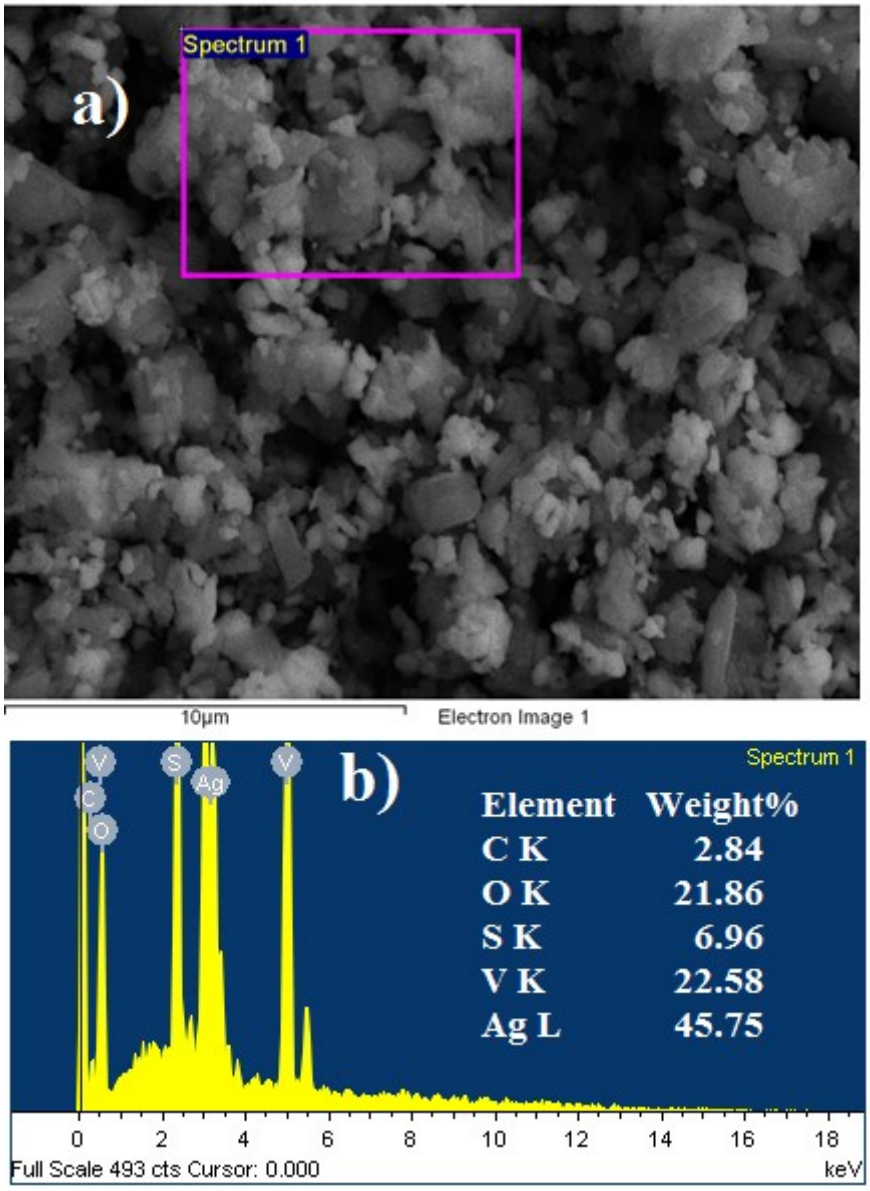

Fig. S4 EDX analysis of the V_2O_5-Ag_2S (1:1 ratio) composite.

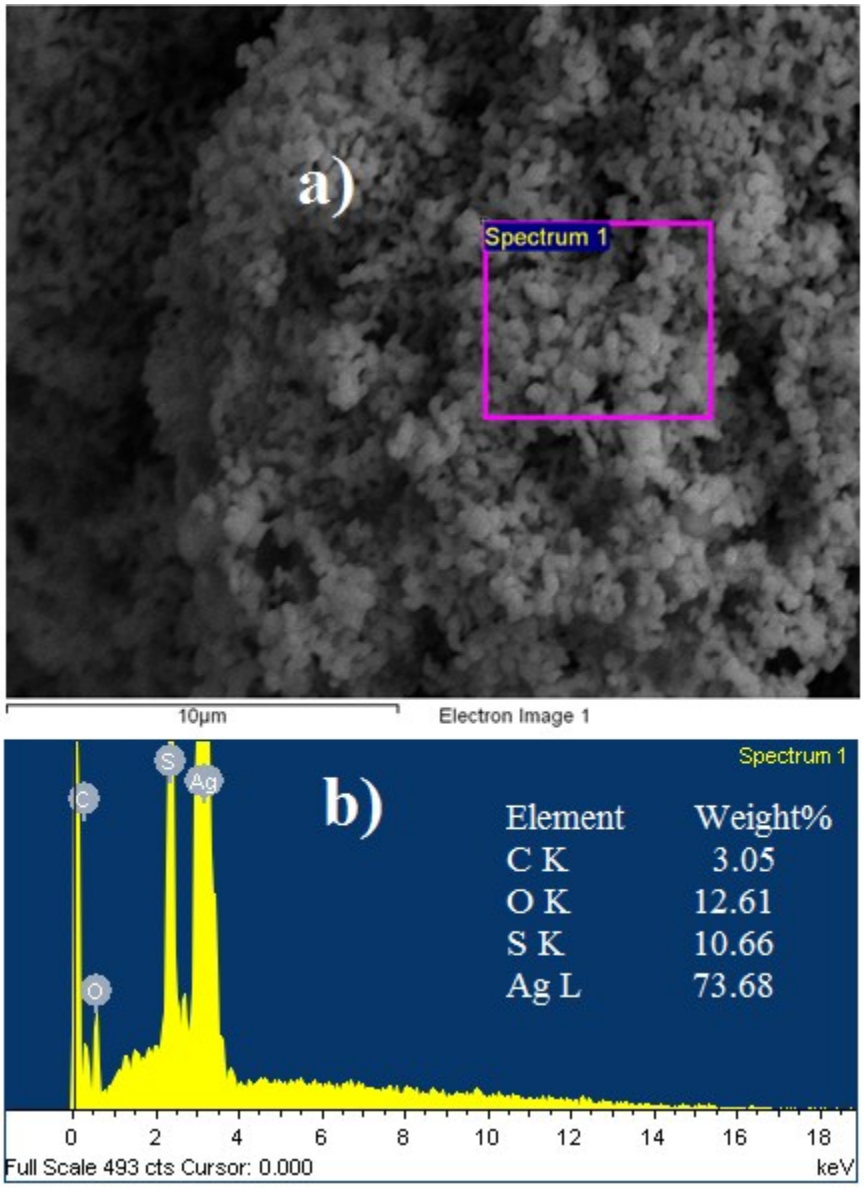

Fig. S5 EDX analysis of the Ag_2S.

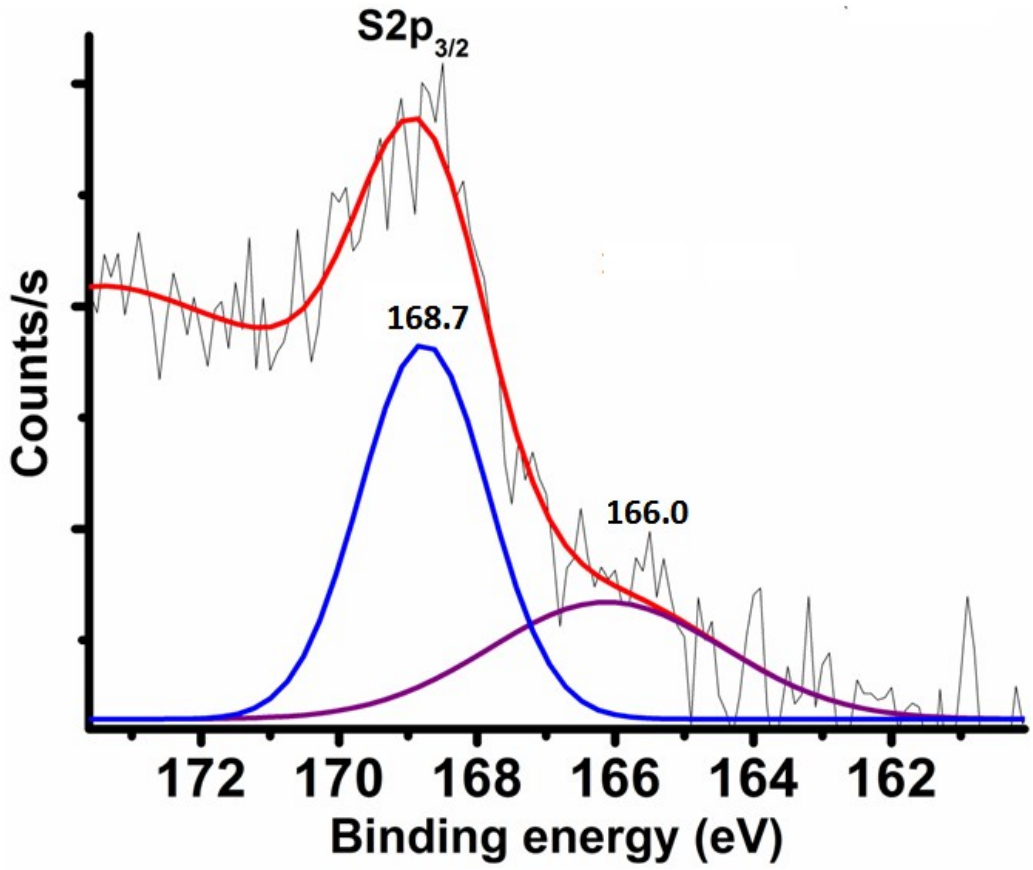

Fig. S6 XPS spectra for sulfur of the V_2O_5-Ag_2S composite on after solid state grinding.

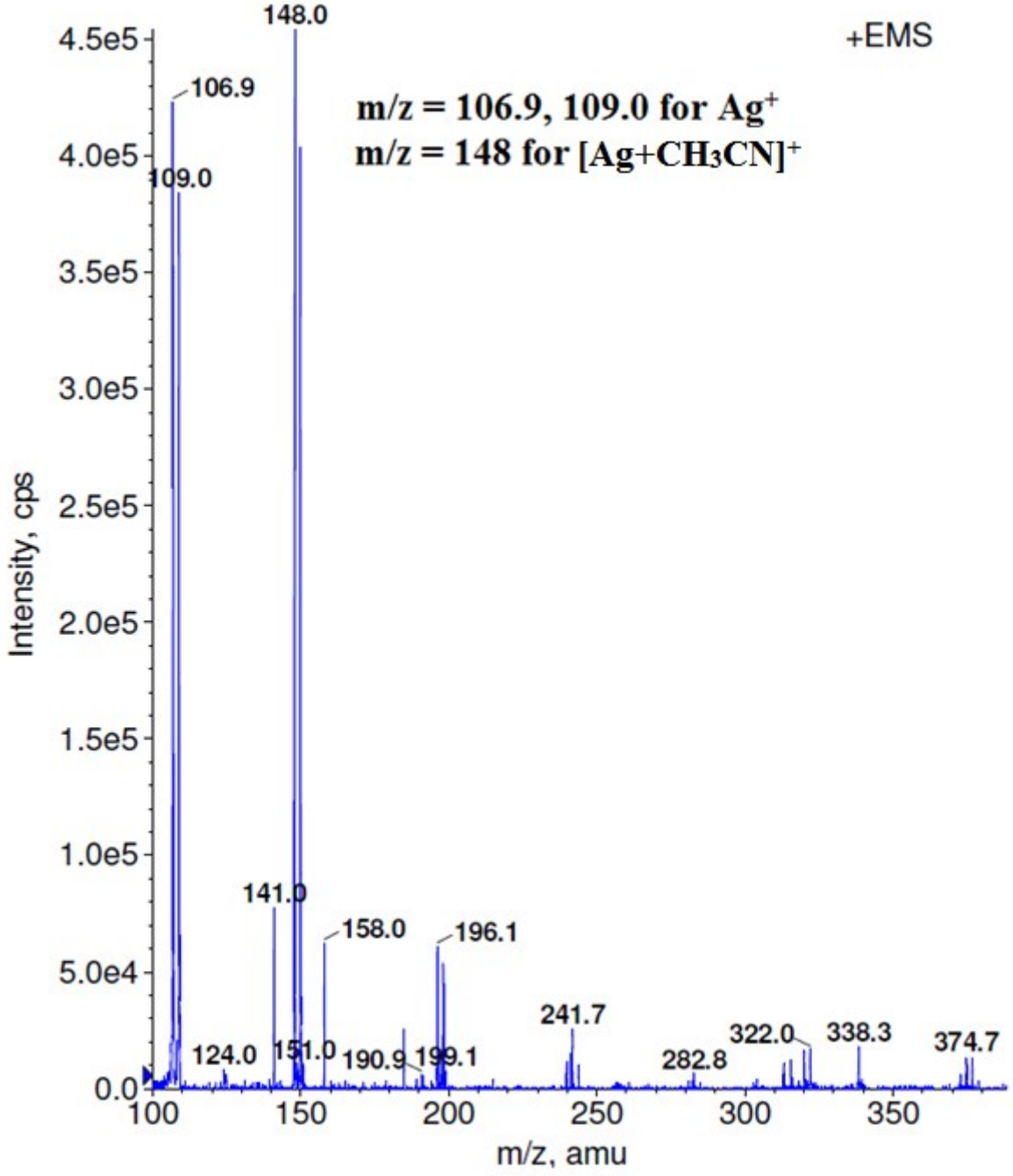

Fig. S7 +ESI-MS of the reddish solution before AgCN extraction.

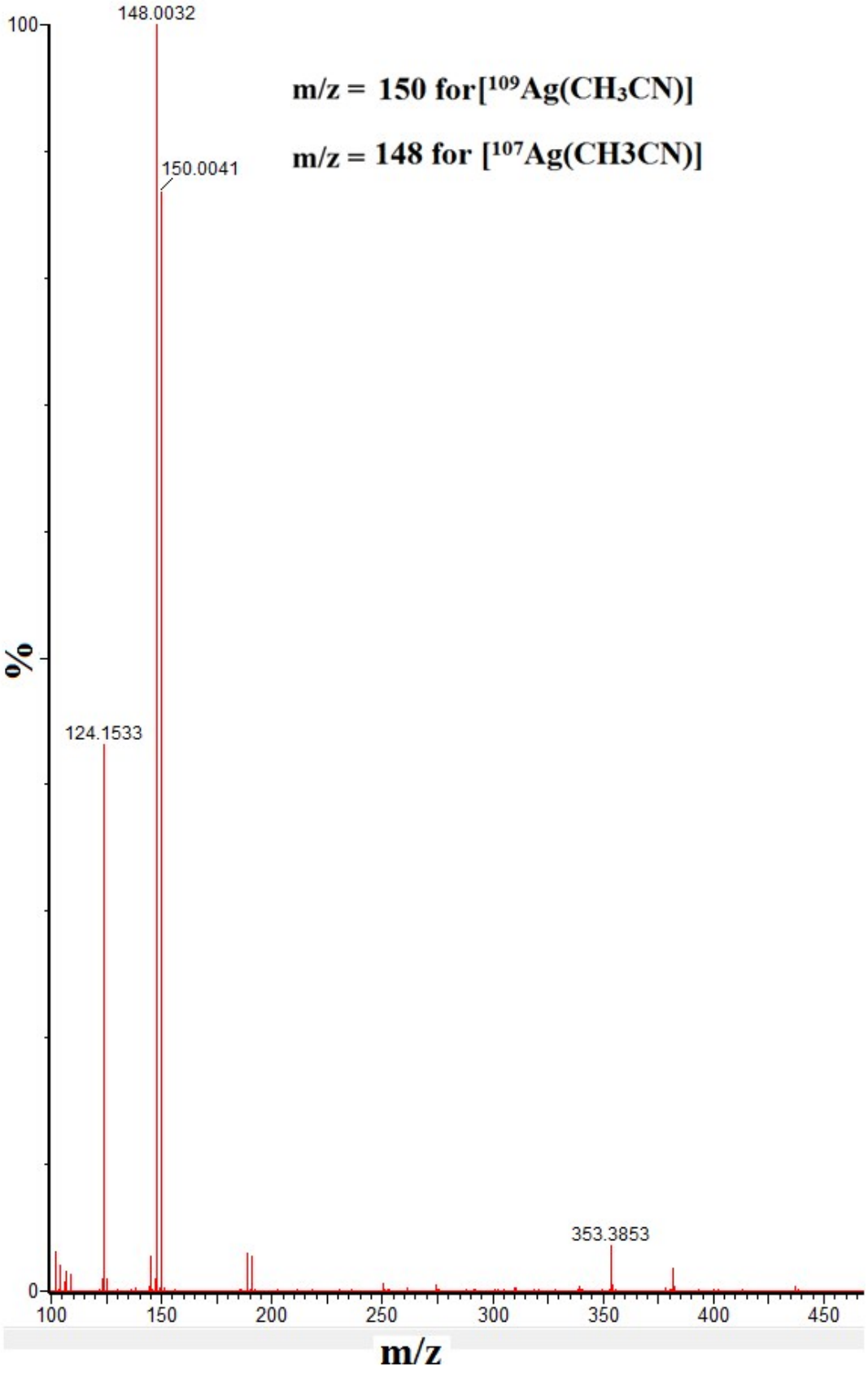

Fig. S8 HRMS of the reddish solution before AgCN extraction.

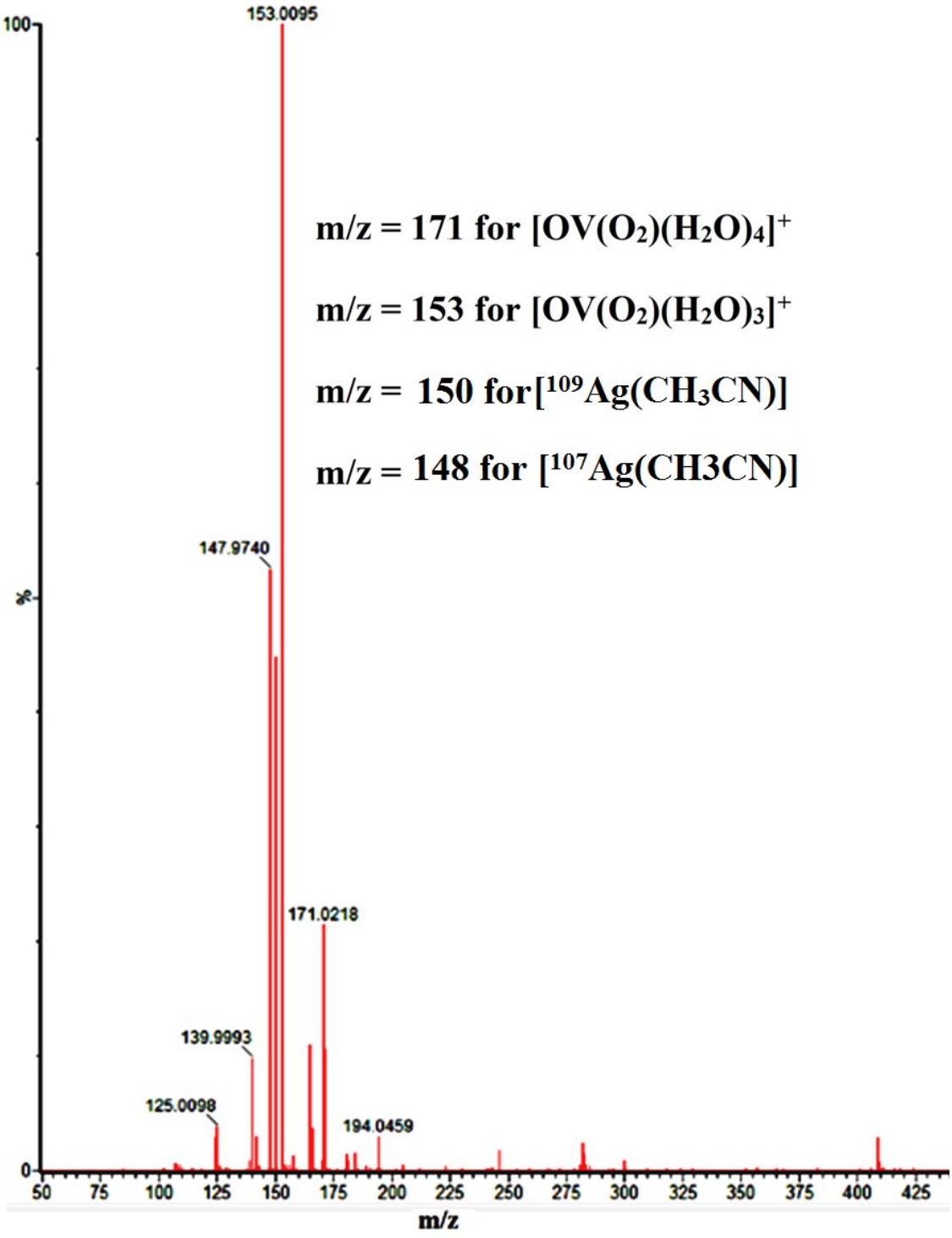

Fig. S9 HRMS of the aliquot after separation AgCN.