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Raman study of supported molybdenum disulfide single layers WILLIAM DURRER, FELICIA MANCIU, Physics Department, University of Texas at El Paso, PAVEL AFANASIEV, GILLES BERHAULT, Institut de Recherche sur la Catalyse et l'Enironnement de Lyon, IRCELYON, CNRS - University of Lyon, F-69626 Villeurbanne, France, RUSSELL CHIANELLI, Materials Research and Technology Institute, University of Texas at El Paso, TX 79968 — Owing to the increasing demand for clean transportation fuels, highly dispersed single layer transition metal sulfides such as MoS_2-based catalysts play an important role in catalytic processes for upgrading and removing sulfur from heavy petroleum feed. In its crystalline bulk form, MoS_2 is chemically rather inactive due to a strong tendency to form highly stacked layers, but, when dispersed as single-layer nanoclusters on a support, the MoS_2 becomes catalytically active in the hydrogenolysis of sulphur and nitrogen from organic compounds (hydrotreating catalysis). In the present studies alumina-supported MoS_2 samples were analyzed by confocal Raman spectroscopy. Evidence of peaks at 152 cm^{-1}, 234 cm^{-1}, and 336 cm^{-1}, normally not seen in the Raman spectrum of the standard bulk crystal, confirms the formation of single layers of MoS_2. Furthermore, the presence of the 383 cm^{-1} Raman line suggests the trigonal prismatic coordination of the formed MoS_2 single layers. Depending on the sample preparation method, a restacking of MoS_2 layers is also observed, mainly for ex-thiomolybdate samples sulfided at 550 $^\circ$ C.

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