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A REVIEW OF SURFACE SPECTROSCOPIC TECHNIQUES AND THEIR APPLICATION TO HYDRODESULPHURIZATION (HDS) CATALYST RESEARCH AT CANMET'S ENERGY RESEARCH LABORATORIES

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(ABSTRACT ONLY)

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ABSTRACT

A brief overview of the theory of the four most popular surface chemical analysis techniques is presented. These techniques include X-ray photoelectron spectroscopy (XPS) also referred to as electron spectroscopy for chemical analysis (ESCA); auger electron spectroscopy (AES), which includes scanning auger microsocopy (SAM); secondary ion mass spectroscopy (SIMS), which includes ion microprobe mass spectroscopy (IMP); and ion scattering spectroscopy (ISS).

Knowledge of the solid surface is essential for producing optimized heterogeneous refinery catalysts and for understanding the catalyst mechanism leading to improved catalyst performance at the most economical operating condition (hydrocarbon selectivity, yields and catalyst resistance to poisoning, fouling, etc.)

A discussion of the qualitative and quantitative nature of these surface analytical techniques is followed by the results of two Co, Mo-alumina catalyst studies completed in the Catalysis Research Section at ERL/CANMET, Ottawa.The first study was a surface chemical examination (XPS, AES, SAM) of a commercial hydrodesulphurization (HDS) catalyst after sulphidation. The other project involves the manufacture of a novel thin-film HDS catalyst followed by reduction, sulphidation and exposure to thiophene. XPS and AES techniques are used to monitor chemical changes at the catalyst surface while changes in the product gas compositions is measured by gas chromatography.