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Reactivity of Germanium (100)-2x1 with diethyl ether

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There is a great interest in the development of new devices for the microelectronics industry. Changes in materials are continually tried to obtain better performance and higher speed devices. Germanium (Ge), in its natural state, is one of the semiconductors that seems to offer such characteristics for future generation devices. Nevertheless, one of the factors that do not allow us to use it adequately is its interface instability with other components. Here we examine the reactivity of diethyl ether (C4H10O) on Ge with the purpose of controlling the germanium interface. The reactions are investigated with Auger Electron Spectroscopy (AES) and Ultra-Violet Photo-electron Spectroscopy (UPS). The Ge(100)-2x1 dimer surface is prepared by first thermally removing the native oxide-terminated surface at temperatures greater than ~870K. Surface pretreatment includes extensive degassing at high temperatures and argon ion (Ar+) sputtering at room temperature, under ultra-high vacuum (UHV) conditions. Controlled exposures of diethyl ether to the Ge surface are done with a variable leak valve connected to a stainless steel tube doser. The thermal stability of C4H10O on the germanium surface is examined, as well as, its coverage dependence. The solid state spectrum of diethyl ether will be compared with its gas phase spectrum and the molecular orbital energies calculated by density functional theory (DFT). The thermal behavior of diethyl ether with germanium will be monitored by UPS and compared with possible calculated intermediates. The results of these studies will provide the foundation for a more detailed photoelectron spectroscopy and temperature programmed desorption investigation.