

Ta Surface Chemistry in Aqueous Solutions, and
Investigations into the Electrodeposition of Metal

Dichalcogenides

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Tantalum is an important refractory metal, used to form barrier layers in microelectronics. The Chalcogenides of Ta are layered semiconductors, van der Waals materials. They have photovoltaic applications, and exhibit charge density waves (CDW). This project regards the formation of metal chalcogenides for studies of charge density waves (CDW). Some feel charge density waves may have important applications for microelectronics down the road. Presently there are questions concerning whether such materials be formed using present technology. Most CDW are studied on materials formed at high temperatures, 800 deg C, using vapor transport. This method, so far, does not appear to be one applicable to formation of devices on the Fab floor.

The studies to be presented have been designed to see if an aqueous electrochemical atomic layer deposition (e-ALD) methodology can be developed to form these materials at low temperatures. To start with, studies of the reduction of the oxides which form on Ta are being performed. In addition, the deposition of Te, and S films on Ta are being studied using in-situ STM, and surface analysis techniques such as XPS and Auger. The next step is to electrodeposit Ta, and several soluble Ta species are being investigated.