**ABSTRACT**

 A surface plasmon resonance based fiber optic sensor with Platinum (Pt) coated with Transition Metal Dichalcogenides (TMDCs) - Molybdenum disulfide (MoS2), Molybdenum diselenide (MoSe2), Tungsten disulfide (WS2) and Tungsten diselenide (WSe2) is theoretically studied and analyzed (taking a metal and a TMDC at a time). The attenuated total internal reflection method along with Krestchmann configuration has been used to analyze the performance of the sensor. The sensitivity of the sensor increases linearly with increase in refractive index of the sensing medium for all thickness of Co and Ni (from 20 nm to 60 nm) and for increase in the number of TMDC layer. SPR sensor with 60 nm Platinum and five layers of WS2 exhibits highest sensitivity of 4798.4 nm/RIU. The utilization of Pt instead of Noble metals like gold and silver improves the performance of the sensor. The proposed WS2 assisted sensor will surely be a promising candidate for high performance sensing applications.