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Carbon Film in Radio Frequency Surface Plasma Sources with Cesium

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It is very likely that a long lifetime of cesiation in SNS RF surface plasma sources (SPS) can be connected with deposition into the emitter/converter cone and to the discharge chamber some specific carbon films.

The work function dependence for graphite with alkali deposition has no minimum typical for metals and semiconductors and a final work function is higher. By this reason the probability of H⁻ secondary emission from cesiated metal and semiconductors can be higher than from cesiated carbon films but less can better keep the cesiation and can operate with low cesium consumption.

It is known that a two-dimensional graphite films and films of pyrolytic graphite can adsorb and trap alkali atoms with very high probability (sticking coefficient ~1) up to very high temperature and can be desorbed by heating up to high temperature, much higher than for evaporation from a metal surface. A dynamic of carbon film formation and alkali atoms trapping is well investigated in high vacuum conditions but in SPS these processes are complicated by high gas density and by gas discharge plasma. Investigation of these processes in condition of real SPS can be important to improve the SPS performances.

Primary authors: Prof. DUDNIKOV, Vadim (muons, Inc); JOHNSON, Rolland (muons, Inc); MURREY, Sydnei (ORNL); PINNISI, Terri (ORNL); WELTON, Robert (ORNL); STOCKLI, Martin (ORNL); DUDNIKOVA, Galina (UMD, ICT); STINSON, Chris (ORNL)

Presenters: Prof. DUDNIKOV, Vadim (muons, Inc); DUDNIKOV, Vadim (Muons, Inc)

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