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Magnetic field dependent plasma chemistry variations in reactive pulsed arc discharges.

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The effect of a magnetic field on the plasma chemistry and pulse-to-pulse fluctuations of cathodic arc ion charge state distributions in a reactive environment were investigated. The plasma composition of pulsed aluminum plasma streams generated from cathodic arc spots was measured by time-of-flight charge-to-mass spectrometry. The relative standard deviation for the average concentrations of Al^{+}, Al^{2+} and Al^{3+} were increasing with an increasing magnetic field. These findings are qualitatively consistent with the model of partial local Saha equilibrium describing the transition from equilibrium to non-equilibrium of the expanding plasma. The results are of fundamental importance for the evolution of the structure of films deposited by reactive cathodic arc deposition.