

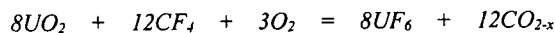
Reaction of Uranium Dioxide with CF₄/O₂ r. f. Plasma

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Abstract

Research on the etching reaction of UO₂ in CF₄/O₂ r. f. plasma is carried out at temperatures of up to 370 °C under the total pressure of 0.3 Torr. The reaction rates are investigated as functions of CF₄/O₂ ratio, plasma power, and substrate temperature. It is found that the highest etching rate is obtained at 20%O₂ mole fraction regardless of r. f. power and substrate temperature. The highest etching reaction rate at 370 °C under 150W exceeds 1000 monolayers/min., which is equivalent to 0.4 μm/min. The mass spectrometry analysis result reveals that the major reaction product is uranium hexa-fluoride UF₆. Based on the experimental findings, dominant overall reaction of uranium dioxide in CF₄/O₂ plasma is determined:



where CO_{2-x} represents the undetermined mix of CO₂ and CO.