QED Induced EUV Lithography

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Topic: Fundamental physics approaches for sources

Difficulties in extending Moore's law to 13.5 nm may be traced to LPP lithography. Based on classical physics, EUV light requires the ionization of atoms at high temperature. LPP uses high power CO_2 lasers to heat solid and gas targets that produce EUV light by atomic emission. LPP systems are not only complex, but very expensive costing as much as US $120 million. QED induced EUV lithography based on QM offers a far simpler and inexpensive alternative in extending Moore's law. QED stands for quantum electrodynamics and QM for quantum mechanics. The EUV source comprises an ordinary spherical glass lens provided on the front surface with a nanoscale zinc oxide coating. A heater on the back surface allows EM energy to flow into the coating, but QM precludes any increase in the temperature of the coating. Instead, QED converts the heat into the coating to a steady EUV light source. Lasers are not required. The EUV wavelength is 2nd, where n and d are the refractive index and thickness of the coating. For zinc oxide, the QED radiation induced for coating thicknesses d < 5 nm is in the EUV having wavelengths < 20 nm, the degree of coherency depending on control of thickness variations. Extensions are made to mobile hand-held EUV sources for irradiating biological specimens.

Oral presentation is requested.

Biography

Thomas Prevenslik is a retired American living in Hong Kong and Berlin. He is a graduate of Carnegie Institute of Technology and the University of Pittsburgh. During his career, he worked as a Mechanical engineer performing ANSYS computer simulations in structural dynamics and heat transfer of space telescopes and gas bearing suspensions working for Owens-Illinois and Contraves-Goerz. Thomas became involved in nanotechnology because classical physics failed to provide rational explanations of nanoscale observations. Based on quantum mechanics, he developed the theory of QED induced radiation that requires the heat capacity of the atom to vanish in nanostructures, thereby precluding the conservation of absorbed EM energy by the usual increase in temperature. Instead, QED converts the absorbed energy to EM radiation that charges the nanostructure, or is emitted to the surroundings. See diverse QED applications at http://ww.nanoqed.org