CLAIMS

1. A system comprising:

a source of electromagnetic radiation configured to transmit a measurement pulse in open air to a workpiece, the pulse having at least one wavelength with higher energy than a work-function of a metal layer of the workpiece, and giving rise to electrically charged molecules deriving from interactions of air molecules with free electrons that were emitted by the metal layer in the workpiece, the quantity of free electrons emitted being dependent on the extent of exposure of the metal of the workpiece;

an anode;

a resettable electric charge sensor (ECS), operably connected to the anode the ECS being configured to, subsequent to an ECS activation, accumulate electric charge derivative of charged molecules received at the anode;

a control unit, operably connected to the ECS, and configured to:

a) activate the ECS in accordance with:

a time of initiation of a measurement pulse, and

a first molecule delay adjustment;

b) receive, from the ECS, at least one value indicative of an amount of charge accumulated since ECS activation, the receiving being in accordance with:

a time of cessation of the measurement pulse, and

a second molecule delay adjustment,

c) determine, from the at least one value, a second value indicative of a quantity of charged molecules received at the anode that were derivative of electrons emitted by the workpiece responsive to a measurement pulse;

d) perform at least one of:

i) identifying at least one of: exposure or disappearance of the metal layer in accordance with, at least, the second value, and

ii) controlling drilling in accordance with, at least, the second value.

2. The system of claim 1, wherein at least one value indicative of a quantity of at least part of the charge collected comprises a voltage.

3. The system of claim 1, wherein each molecule delay adjustment is determined in accordance with at least one of:
one or more tracked molecule types,
an electric field potential of the anode, and
a temperature of the open air.

4. The system of claim 1, wherein the second value is determined in accordance with a known collection efficiency.

5. The system of claim 1, wherein the ECS is ungrounded, and wherein the second value is determined in accordance with a voltage of the anode.

6. The system of claim 1, wherein the receiving the at least one value comprises:
periodically receiving value indicative of an amount of charge accumulated since ECS activation, thereby giving rise to a signal; and
determining the second value from the signal, using signal processing methods.

7. The system of claim 1, wherein determining the second value comprises compensating for switching noise in the at least one value.

8. The system of claim 1, wherein the determining the second value comprises compensating for leakage current in the at least one value.

9. The system of claim 1, wherein the pulse energy of the radiation source is configured so that workpiece potential emerging due to electrons emitted from the metal layer of a given composition over a number of pulses, according to the composition, the pulse energy, and the number of pulses, is no more than 10 percent of the anode voltage.

10. The system of claim 6, wherein the ECS is configured with sensitivity no larger than 1 percent of the charge of electrons emerging emitted from the metal layer according to its composition and the pulse energy of the radiation source.