layer. For example, CAR materials can generate multiple chemical reactions upon exposure to radiation, thereby chemically amplifying a response to the radiation, which reduces sensitivity (in other words, lower exposure doses are required for defining the pattern in the resist layer). CAR materials typically include a polymer that is resistant to an IC process (such as an etching process), an acid generating component (such as a photoacid generator (PAG)), and a solvent component. The PAG generates acid upon exposure to radiation, which functions as a catalyst for causing chemical reactions that decrease (or increase) solubility of exposed portions of a resist layer. For example, in some implementations, acid generated from the PAG catalyzes crosslinking of the polymer, thereby reducing solubility of the exposed portions.

While CAR materials are configured to minimize sensitivity, CAR materials must also satisfy other resist performance characteristics, in particular, resolution (R) and line edge roughness (LER). Resolution generally describes an ability of a resist material to print (image) a minimum feature size with acceptable quality and/or control, where resist contrast, resist thickness loss, proximity effects, swelling and/or contraction of the resist material (typically caused by development), and/or other resist characteristics and/or lithography characteristics contribute to the resolution. Resist contrast generally refers to an ability of a resist material to distinguish between light (exposed) regions and dark (unexposed) regions, where resist materials with higher contrasts provide better resolution, resist profiles, and/or LER. Roughness, such as LER and/or line width roughness (LWR), generally describes whether a pattern in a resist layer includes edge variations, width variations, critical dimension variations, and/or other variations. LER generally describes deviations in edges of a line, whereas LWR generally describes deviations of width of a line (for example, from critical dimension (CDU) width). Improving one resist performance characteristic (for example, reducing LER) often comes at the expense of degrading another resist performance characteristic (for example, increasing sensitivity), such that attempts at simultaneously minimizing resolution, LER, and sensitivity is referred to as RLS tradeoff. Overcoming the RLS tradeoff presents challenges to meeting lithography process demands for advanced technology nodes (for example, 14 nanometers, 10 nanometers, 5 nanometers, and below).

Extreme ultraviolet (EUV) lithography, which utilizes radiation having wavelengths in the EUV range, provides promise for meeting finer lithography resolution limits, particularly for sub-10 nm IC manufacturing. However, higher sensitivity CAR materials are often required at EUV wavelengths because exposure doses required for meeting resolution, contrast, and/or LER requirements, along with throughput requirements (such as wafers per hour (WPH)), are limited by conventional EUV sources. For example, since a number of photons absorbed by a volume of a resist material is proportional to wavelength and an amount of absorbed energy is proportional to exposure dose, a total absorbed energy is discretized into fewer photons as wavelength decreases. It has thus been observed that a volume of resist material absorbs fewer EUV photons than DUV photons (such as ArF photons) when exposed to the same exposure dose (for example, about 10 mJ/cm^2), which often means that less acid will be generated by CAR materials for catalyzing reactions. In some cases, the volume of resist material absorbs as much as 14× fewer EUV photons. Such phenomenon is generally referred to as shot noise. Though increasing EUV exposure dose can alleviate the shot noise, thereby improving resolution, contrast, and/or roughness, such is achieved by increasing EUV source power or decreasing scan speed (in other words, decreasing throughput, such as wafers per hour (WPH)). Since current EUV sources are limited to EUV source power of about 80 W and decreasing throughput is not a viable option for meeting next generation IC manufacturing requirements, the developing process is currently being explored for improving sensitivity of CAR resist materials while still meeting other RLS characteristics, such as resolution and LER.

There are generally two types of developing processes: a positive tone development (PTD) process and a negative tone development (NTD) process. The PTD process uses a positive tone developer, which generally refers to a developer that selectively dissolves and removes exposed portions of the resist layer. The NTD process uses a negative tone developer, which generally refers to a developer that selectively dissolves and removes unexposed portions of the resist layer. PTD developers are typically aqueous base developers, such as tetraalkylammonium hydroxide (TMAH), and NTD developers are typically organic-based developers, such as n-butyl acetate (n-BA). Both PTD processes and NTD processes have drawbacks when attempting to meet lithography resolution demands for advanced technology nodes. For example, both PTD processes and NTD processes (particularly those using NTD developers that include n-BA solvents) have been observed to cause resist pattern swelling, leading to insufficient contrast between exposed portions and unexposed portions of the resist layer (in other words, poor resist contrast) and resulting in higher than desired LER/LWR and/or low patterning fidelity. However, because NTD processes typically provide better normalized image log-slope (NILS) than PTD processes, NTD processes have become the focus for improving resolution for advanced technology nodes. The present disclosure thus explores NTD developers and corresponding lithography techniques that can improve sensitivity of CAR materials (specifically, reducing an amount of exposure dosage required) to EUV radiation without degrading resolution and roughness, thereby overcoming the RLS tradeoff and achieving high patterning fidelity for advanced technology nodes.

FIG. **1** is a flow chart of a lithography method **100** for processing a workpiece (for example, a substrate) according to various aspects of the present disclosure. In some implementations, method **100** is implemented, in whole or in part, by a system employing advanced lithography processes, such as DUV lithography, EUV lithography, e-beam lithography, x-ray lithography, and/or other lithography to enhance lithography resolution. At block **102**, a resist layer is formed over a material layer of a workpiece. In some implementations, the resist layer is a negative tone resist layer, and the material layer is a portion of a wafer (or substrate). At block **104**, the resist layer is exposed to radiation, for example, patterned radiation. In some implementations, the resist layer is exposed to patterned EUV radiation. In some implementations, after exposure, the resist layer is baked, for example, by a post exposure baking process. At block **106**, the resist layer is developed using a developer having an organic solvent having a log P value greater than 1.82, thereby forming a patterned resist layer. The organic solvent is an ester acetate derivative represented by R_1COOR_2, where R_1 and R_2 are hydrocarbon chains having four or less carbon atoms. In some implementations, R_1, R_2, or both R_1 and R_2 are propyl functional groups. In some implementations, R_1 is n-propyl and R_2 is isopropyl. In some implementations, R_1 is isopropyl and R_2 is n-propyl. In