

Chemistry under the sink

Chemistry is not just confined to the laboratory – you will find a wealth of it under your kitchen sink (CHEMISTRY REVIEW Vol. 27, No. 4, pp. 13–15). **Chiara Durrani** explains

Bleach

There are different types of bleach, but the active ingredient in household bleach is sodium hypochlorite (NaClO , CHEMISTRY REVIEW Vol. 29, No. 2, pp. 10–13). It is used as a disinfectant due to its effectiveness and wide range of actions against bacteria, viruses, fungi and algae. It works by denaturing proteins, causing them to clump together and become useless.

Sodium hypochlorite is a strong oxidising agent – it can gain electrons from other molecules. When these electrons come from double bonds, this can lead to the bleaching (colour lightening) effect, often seen when household bleach comes into contact with coloured fabrics. Chromophores – the parts of molecules with delocalised electrons that absorb visible light and give rise to colour (CHEMISTRY REVIEW Vol. 34, No. 2, pp. 6–9) – are disrupted when their double bonds are broken. The bleaching property of sodium hypochlorite leads to its use as a stain remover.

Washing-up liquid

We use washing-up liquid to help remove traces of food from our plates (CHEMISTRY REVIEW Vol. 17, No. 3, pp. 17–19). Why does it make doing the dishes so much easier?

Washing-up liquid contains detergent molecules, which are amphiphilic, meaning that they each have a hydrophilic head group and a hydrophobic tail. In water detergent molecules form spherical *micelles*, with the water-loving heads facing outwards and the water-hating tails facing inwards. Therefore, non-polar, hydrophobic fat molecules from the dirty dishes become trapped inside the micelles, making them water-soluble, so they can be washed away (CHEMISTRY REVIEW Vol. 34, No. 1, pp. 2–6).

Detergent molecules also make washing up easier by reducing the surface tension of water. They lower the cohesive forces between water molecules, making the water 'flow' more.

Disinfectant spray

Chloroxylenol (4-chloro-3,5-dimethylphenol, Figure 1) is a biocide used in some disinfectant sprays. It makes the product effective at killing many species of bacteria by disrupting bacterial cell walls and possibly also causing inactivation of cellular enzymes, resulting in cell death.

Not only is chloroxylenol an ingredient in cleaning sprays, but it is also used as an antiseptic. This means that it can be found in hand washes, soaps, skin disinfectants and various topical medications.

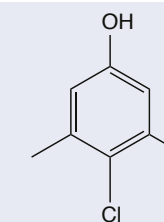


Figure 1 Chloroxylenol (4-chloro-3,5-dimethylphenol)

Air freshener

Air fresheners are commonplace in many households, but, even with their pleasant smell, they are not necessarily a positive presence. They are a primary source of volatile organic compounds (VOCs), which can cause sensory irritation and contribute to indoor hazardous air pollutants (CHEMISTRY REVIEW Vol. 32, No. 4, pp. 6–9). This can be either through direct emissions or secondary reaction products, as the emissions react with indoor oxidants.

However, there are some precautions in place to protect the environment. In the past, chlorinated fluorocarbons (CFCs) were used as propellants in air fresheners and other aerosols. However, due to their long residence time in the atmosphere and their role in depleting the ozone layer, this is no longer the case (pp. 26–31).

Microfibre cloths

Microfibrils are typically made from synthetic polyester (CHEMISTRY REVIEW Vol. 17, No. 1, pp. 17–20) or polyamides (CHEMISTRY REVIEW Vol. 20, No. 1, pp. 29–32), which are split into thinner fibres during production. This results in sharp edges within the fibre surface, making microfibre cloths great for cleaning dust and oils off surfaces without the need for detergent.

These cloths are also said to be 'self-cleaning'. This is because the polymers used have a high hydrophobicity, which means that contaminating particles that adhere to water droplets are removed as water rolls off the fabric.

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