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COAL AND PETROLEUM

Is oil a "rock"? Most of the things we think of as rocks are made up of inorganic (non-living) matter. Coal and petroleum originated as plants and other living organisms, the remains of which were transformed by geological processes into coal and petroleum. So instead of being made up of iron, silica, and aluminum; they are made up almost exclusively of carbon and hydrogen, with varying amounts of sulfur and nitrogen. When we burn these "fossil fuels", we are releasing energy that was stored from sunlight millions of years ago.

In prehistoric times, as the vegetation in swamps and forests died and fell to the ground, it formed thick layers of leaves, branches, and wood. Layer upon layer pressed the water out of this vegetative material, and transformed it into peat, and later, perhaps, into lignite or bituminous coal. As should be clear from the way they are formed, lignite and bituminous coal would be considered sedimentary rocks. Sometimes bituminous coal is metamorphosed into anthracite, or "hard" coal, a metamorphic rock.

Peat and all of the forms of coal can be burned as fuel, but peat and lignite burn with a smoky flame due to their relatively high water content. Bituminous coal, and especially anthracite, have a higher proportion of fixed carbon, and so burn more cleanly and generate more heat per pound of coal. Currently, over half of the electricity in the United States comes from the burning of coal.

Petroleum is also formed from the carbonization of organic matter. Petroleum probably originated as deposits of microscopic marine organisms in shallow coastal bays. The mud and clay at the bottom of these bays were gradually converted to sandstone and shale. As the remains of the living organisms were carbonized, they formed a carbon-rich liquid that was trapped in the pores of the surrounding rock. This is petroleum, or crude oil.

Because the petroleum is less dense than seawater and the surrounding rock, it moves through the permeable sandstone or shale until it is trapped beneath an impermeable layer. Here the petroleum will form a deposit or "trap". Drilling into these trapped reservoirs of petroleum provides much of the petroleum we use today for fuel and as a starting material for many of our plastics.

Crude oil is processed at huge oil refineries. The oil is separated by distillation into very light components, which are good starting points for plastics, medium components, like gasoline and diesel fuels, and heavier materials, for example grease and petroleum jelly. Plastics are made by mixing the light petroleum fractions with catalysts and other additives. In principle, nearly all plastics can be recycled and their component parts made into new plastic; but different types (for example, milk jugs and plastic bags) should be recycled separately.

For more information see:
www.teachingtools.com/Slinky/petrol.html
www.eia.doe.gov/kids/recycling/solidwaste/plastics.html